ELECTRICAL WEST

A McGRAW-HILL PUBLICATION

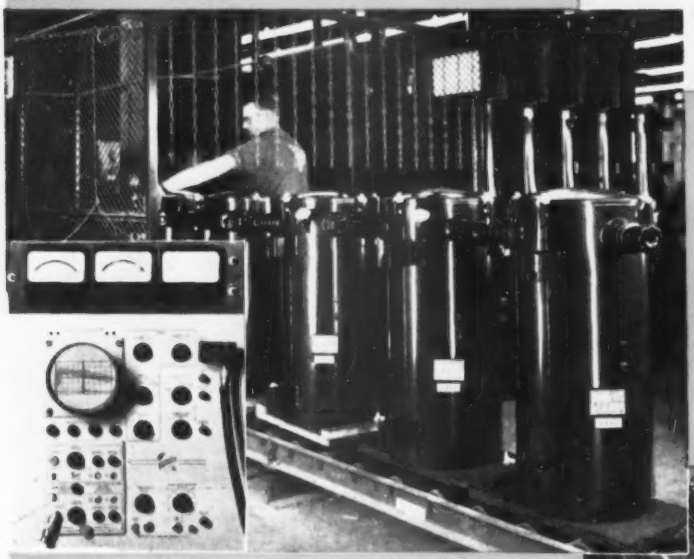
July 1959
50 Cents

Cougnards Trap Lightning

IMPULSE TESTED

DESIGN

High impulse strength in transformers is not attained by accident; it must be considered from the very beginning of design. Such is the case at R T & E, where transformer design is based on impulse withstand levels approximately 50% in excess of NEMA standards.



TESTING

Every R T & E Transformer receives an "on the line impulse test" through use of the most modern equipment and methods known. This test not only insures that the transformer meets NEMA impulse level requirements but also rejects those transformers that are not of maximum quality.

OPERATION

Naturally, the ultimate in testing is provided "on the system", where nature subjects the transformer to the most rigorous tests. R T & E Transformers have been thoroughly proven in operation in every climate of the U. S. They have been awarded the invisible seal of customer satisfaction, proved by a growing list of customers who specify R T & E.

R T & E CORPORATION
WAUKESHA, WISCONSIN

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power for America

editorial views

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Misinterpretation—A convention echo of unpleasant pitch has developed in the play-back of a speech at the recent PCEA convention as reported in the NECA News Letter of May 30. General Electric's vice-president, James Goss, suggested, in the course of his talk on the loadbuilding prospects of the industry, that the power companies might well be responsible for the service entrance in the home up to and including the feeder circuit panel.

The aforementioned NECA News Letter chose to interpret this as a move to "eliminate the contractor." It is difficult to understand how Mr. Goss' suggestion could be interpreted in any other way than as a suggestion to insure an adequate power supply for new homes. Whether the entire service entrance is financed by the owner, the builder or the power company, the primary objective is to obtain sufficient electrical capacity so that the customer can enjoy the blessings of all forms of electrical living, and the whole industry the fruits of forward planning and good selling. Whoever pays for it, the licensed electrical contractor is still the logical man to install the service, as well as the other electrical circuits in the structure.

This is hardly the time or the place to stir up intra-industry antagonism. It has taken too many years to develop and implement the cooperative programs, such as Live Better—Electrically, Housepower and all of the other local and national cooperative campaigns aimed at industry progress. The contractor's place in the industry's scheme of things is assured now and in the foreseeable future. The over-all industry's problem is to sell more things for him to wire up and install.

Take the Initiative Now—One of the greatest weaknesses of the investor-owned utility in combating the encroachment of federal power is a lack of unity. It is not a lack of unity of purpose but a lack of unity in the practical method of banding together to compete with a vast bureaucratic, well-financed machine. Let's take a case in point.

There are rumblings in Washington that the federal government will make a study to determine what kind of a national power transmission grid is needed. At present only the federal government has the manpower, the time, the money and the political inclination to make such a study. The move seems to have been inspired by the proposed tie between the Bonneville Power Administration and California utilities. In any event, such a study would embrace the entire region west of the Rockies and as such becomes of vital concern to the investor-owned utilities in this region.

The question is: "Why let federal government take the initiative in such a matter?" Why is it not possible for the Western power companies, through their associations, to inaugurate a long-range, regional study of future power resources and the associated transmission facilities? Obviously such a study can't be done by an individual company or for an individual company. On the other hand, is it not part of the responsibility of the electric utilities to provide for the public a sound, long-range program which will integrate the vast power resources of the West into a program of their most economical use 25 years hence?

Some such study is going to be made. The question is, will it be made under the auspices of the federal government or under the auspices of the investor-owned utilities? From past experience of seeing how political demagogues can twist even the most unbiased engineering study by federal agencies, it would behoove the electric power industry to get together and take the leadership that will shape their future destiny.

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ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U.S. Established 1887

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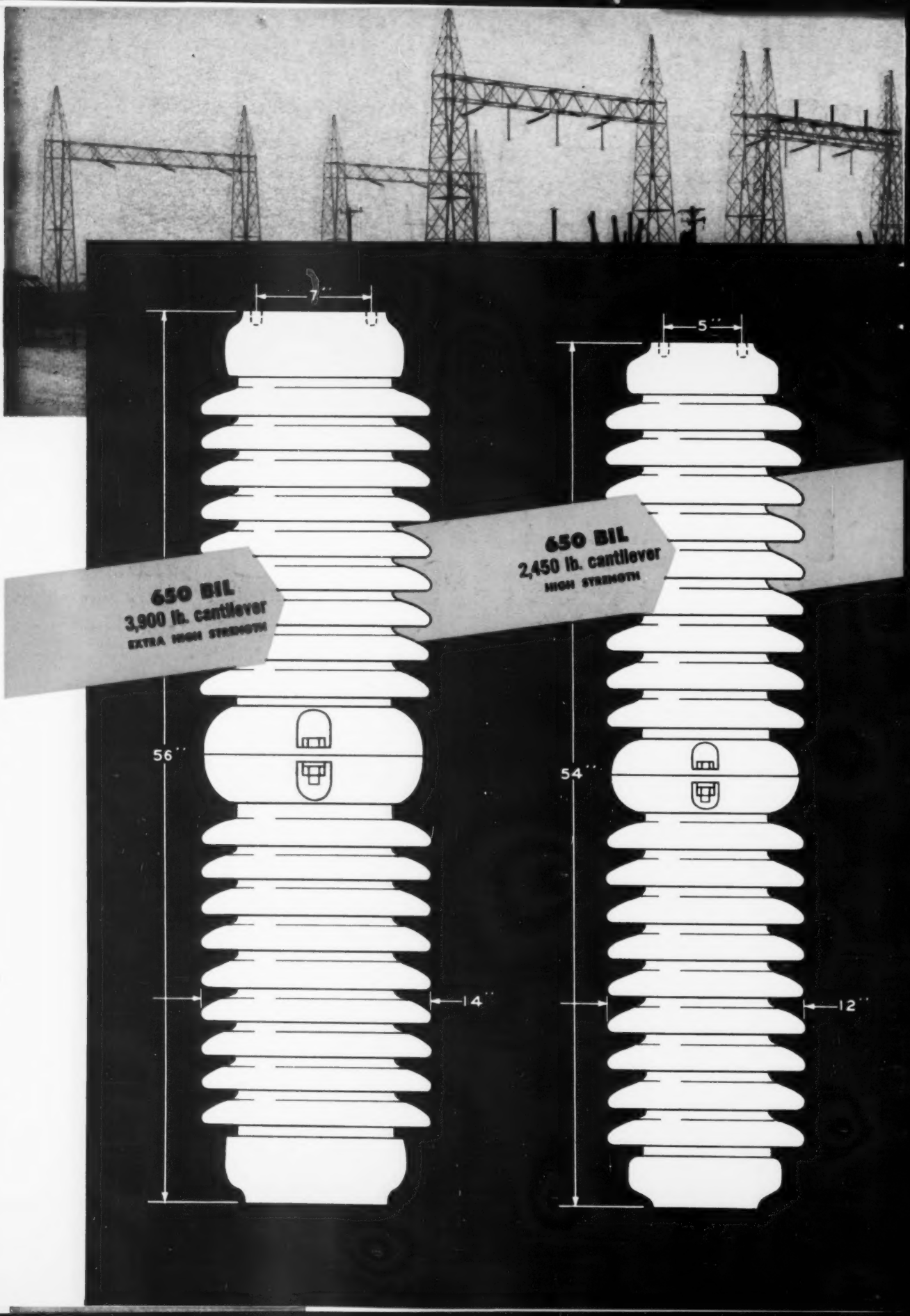
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650 BIL
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HIGH STRENGTH
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5"
56"
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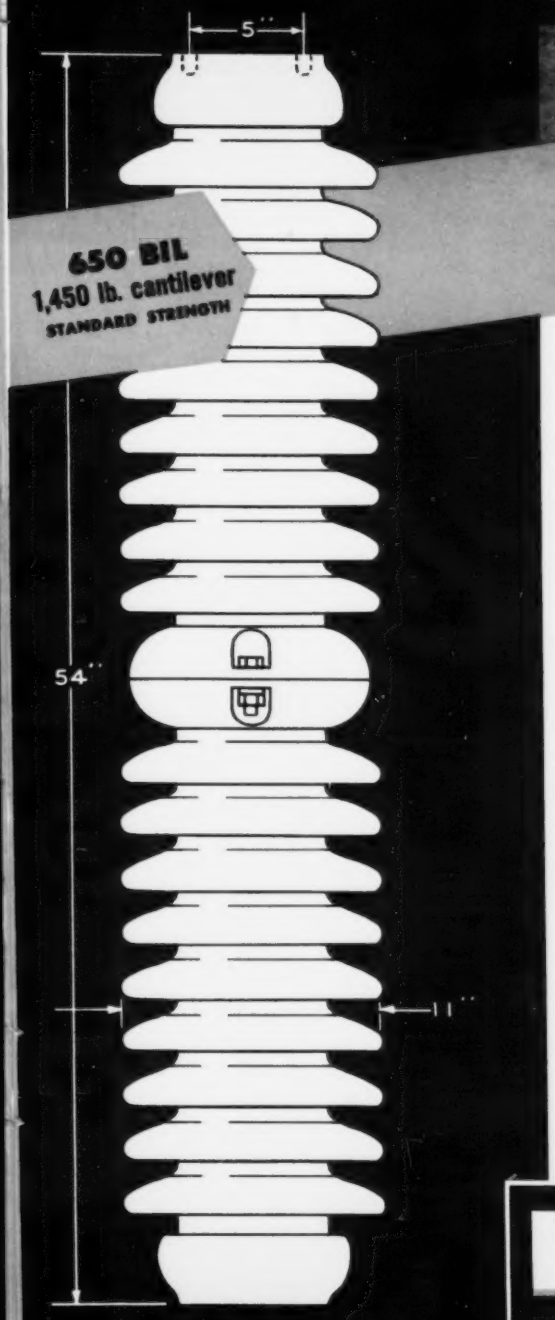
14"
12"



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A safe, long-lasting wiring system is a must for Colonial Williamsburg's Motor House and Cafeteria to safeguard valuable equipment and eliminate future costly repairs. For these reasons, the specifications called for the finest quality conduit. The choice . . . SPANG HD Galvanized Steel Conduit.

22 miles of SPANG Conduit give modern wiring protection for new buildings in *Colonial Williamsburg*

The magnificent restoration of Colonial Williamsburg turns back the clock 200 years. But The Motor House and Cafeteria, nearby, must be equipped to accommodate in 20th Century comfort their share of the 750,000 visitors each year.

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Helping in this task are 22 miles of SPANG HD Galvanized Steel Conduit, which carry the up-to-date wiring. Operated by this extensive system, which is designed for future expansion, are the all-electric kitchen, three 250 hp boilers, and the complete air conditioning system.

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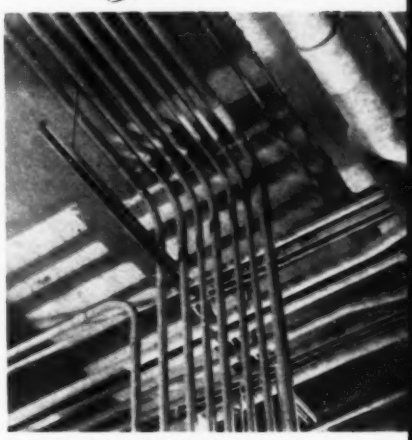

Architect: Colonial Williamsburg Architect's Office; consultant: Harrison & Ambrovitz, New York
Electrical Engineer: Wiley & Wilson, Richmond, Va.
Electrical Contractor: Chewning & Wilmer, Inc., Richmond, Va.
SPANG Distributor: General Electric Supply Co., Richmond, Va.

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news roundup

Two office service employees at McNary Dam, Ernabel Peck and Gloria Lampkin, look over imitation owls that are being used by army engineers to scare away pigeons at the multipurpose dam on the Columbia river. Power line installation atop the dam is shown in the background

Thimking

Papier-mache owls don't give a hoot, but they may get rid of the pigeon nuisance at McNary Dam.

At least that is the hope of army engineers at the big multipurpose project on the Columbia River.

Since the dam went into operation in 1953, it has attracted thousands of pigeons with its many crane booms, power line towers and dark sheltered spillway gate recesses offering numerous nesting places.

In fact, the engineers point out, the dam has attracted pigeons like an upturned syrup can attracts ants. Many ideas were considered by the engineers to solve the pigeon problem, complicated from the standpoint of safety by the fact that there are hundreds of high-voltage lines stretched overhead.

That's where the papier-mache owls came in. It seems that pigeons are just about scared to death of owls. So, the engineers this week began using life-size replicas of owls suspended from strategic spots at the dam to scare away the pigeons.

So far, the engineers have received a dozen of the imitation owls. The make-believe birds are constructed so they hang from two suspension hooks on either side of their heads, moving at the slightest vibration. In addition, with each swinging motion they emit a throaty purr, such as might come from a hungry owl. And, of course, the imitation birds have eyes that gleam as only an owl's eyes can gleam.

Favorable results were reported from first tests of the papier-mache owls. The pigeons have been heading for the hills wherever the owls have been used. Engineers feel that if they can plant the imitation owls near enough to the favorite nesting spots they can get rid of the nuisance completely by giving McNary's pigeons "the bird."

—EW—

WIN A GHOST TOWN—The current popularity of all kinds of contests has reached some sort of a new high with the announcement of the *Saturday Evening Post* that it will award an Arizona ghost town, complete with bar, hotel and near-by gold mine (worked out) to the winner of its new contest for advertising and sales executives.

Known in other days as Stanton, Ariz., the Post has renamed the settlement "Ulcer Gulch." Second prize in the contest is an authentic stage coach. For details write the magazine but hurry as the contest closes July 18.

—EW—

TREASURE HUNT—General Electric is running a contest to find the oldest operating dry-type, general-purpose transformer still in service. When it finds it (the contest closes Friday, Aug. 28), the present owner will be able to trade it in for a brand new modern dry-type transformer of the equivalent rating. Any G-E office will accept entries.

HOT STUFF – Scientists at the Hanford AEC plant have developed a carbon arc image furnace that reproduces temperatures as high as 5,000 F—one-half the surface temperature of the sun.

Operating on the principle of parabolic reflection, the furnace is able to focus energy that will produce these temperatures in an effort to determine the effect of extreme temperatures on ceramic materials. Ceramic atomic fuel elements promise much higher power levels in future reactors, and thus, they contribute significantly toward commercial atomic power installations.

—EW—

Looking for something unusual? A Chicago concern will gift wrap 100-lb bars of chocolate in personalized wooden boxes to be sent as a gift to any happy recipient that you care to designate. They also will provide smaller sizes but who wants to be chintzy?

—EW—

PURITY – At the eighth annual Motor Vehicle Maintenance Conference held recently on the campus of the University of Washington the ground rules are interesting and different.

Its basic rules are that there shall be no advertising, no entertainment, no set speeches and no conclusions drawn. For those attending it was three days of hard work beginning at 8 a. m. and concluding at 8:20 p. m. with breaks only for lunch, dinner and a brief morning coffee break.

Manufacturers are invited to send literature to the conference for distribution to enrollees but this too is screened carefully to exclude that which is devoted entirely to sales appeal. Only service publications are accepted. The same rule applies to motion pictures or visual aids that may be offered. Sales or advertising must be excluded.

The utilities division of the con-

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INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

ference was established experimentally last year and drew more than 60 men from publicly and privately owned utilities and municipalities.

—EW—

PROGRESS REPORT – The DuPont company has produced a striking new booklet describing man's emergence from serfdom to the dignity and responsibility of modern industrial life. Pictorial histories trace the revolution that has come about in working conditions, social structures and standards of living.

The booklet is a thought-provoking resume that might easily be adapted for feature material in the house organs of other industries.

—EW—

Kitten rescue score for Seattle City Light crews now number 37 for 1959. The linemen saved a total of 115 during 1958.

—EW—

PROGRESS – Science seems determined to do away with the faithful old work horse, the steam turbine generator.

Electricity can be generated by forcing an electrically conducting plasma (a gas broken into electrons and ions) through a strong magnetic field. Dr. Joseph L. Neuringer is conducting research on this method of generation for Republic Aviation Corp. He believes that, with intensive research and development, large-scale plasma generators could become a reality within five to ten years. As much as 1,000,000 w could be generated by shooting a stream of plasma at speeds three times that of sound through a magnetic field only three feet long and with the magnetic poles six inches apart, he said.

One of the main problems in commercial production of electricity by plasma generators, according to Neuringer, would be in obtaining a large, steady stream of plasma. This could be produced chemically or by fusion nuclear reactors.

Meanwhile Dr. Clarence Zener, director of the Westinghouse Research Laboratories, reports that within the foreseeable future thermoelectric generators will convert heat directly into electricity with an efficiency as high as 35%.

Westinghouse has received a U.S. Navy contract to "design, construct, test and furnish a 5-kw thermoelectric generator." Construction of the generator is the first step in solving material selection, fabrication, assembly and operating and control problems of a large-scale thermoelectric power plant.

George Gadsby, chairman of the board of Utah Power & Light Co., projects developments of this kind to the future of the automotive industry. He says that a car employing a thermoelectric generator would have a four-wheel, direct drive and would burn kerosene or any other fuel in place of high-octane gasoline.

"When one considers that the overall efficiency of an automobile is only about 10%," he said, "it is almost time to speculate about the future of the American automobile as we know it."

Thermoelectric generation, of course, is only one of the ways science will attempt to send boilers and other paraphernalia to the bone yard.

"Someday the power companies may be paying you instead of sending along a monthly bill," according to Dr. Lawrence J. Giacoletto, manager of the electronics department of Ford Motor Co.'s Scientific Laboratory.

"The possibility of solar power—using sunshine to generate electricity—is not new. However, up to now there has been no feasible plan proposed to store this power."

He offers this solution: Instead of trying to store sun-generated power for individual use, turn excess electricity back into the power lines for daytime industrial use and receive credit for it. The bottleneck at this stage is the prohibitive cost of a large semiconductor solar converter.

—EW—

Allis-Chalmers has announced the release of its Silco-Flex all silicone rubber coil insulating process to licensed motor service shops.

—EW—

SYMPOSIUM—A second world-wide symposium on solar energy will be conducted at Phoenix in 1960 or '64 according to Jan Oostermeyer, president of the Association for Applied Solar Energy.

Founded in Phoenix at the urging of Henry Sargent, then president of Arizona Public Service Co., the association still has financial problems, but retains backing of Phoenix businessmen and the utility. Walter Lucking, Arizona Public Service president, said "the association and

the science of solar energy is on the threshold of great things. There's great need for great discoveries during the next five years."

Planned for the future by the association are a cooperative agreement by the association, New York University and Stanford Research Institute for a research center at Phoenix; publication of a new book on solar energy, and a symposium of solar scientists held late last month.

—EW—

NORTHWEST DIRECTORY – A colorful 68-page directory listing 205 public, private and cooperative electric systems, and related associations and government agencies, in Alaska, Montana, Idaho, Oregon and Washington is now available from the Northwest Public Power Assn., 212 West 13th St., Vancouver, Wash.

Listed are management and policy making officials in each utility, as well as historical data and dates of regularly scheduled meetings. A new feature of this issue is a radio log of Northwest electric systems.

Cost is one dollar.

—EW—

According to the bright publication of Solar Light & Mfg. Co. a man was caught shoplifting a bible in Nashville, Tenn.

—EW—

KUDOS—W. H. Sander., R. A. McBride and Preacher Davis of Southern California Edison Co., accredited with saving a fireman's life while helping to put out a fire in a Flintridge home.

A gas explosion tore out telephone communication and started the fire while they were near by. They radioed for the county fire department and then helped Mrs. Angus MacKillop fight the fire.

The rescue occurred when a fireman fell through a hole in the roof and the three men grabbed him as he was going down head first.

—EW—

FORWARD STEPS—Progress in the desalting of sea water reached new milestones recently when a $2 million experimental plant was announced for construction along the Gulf Coast. Subsequently a different type of process will be tried somewhere along the West Coast. The first of the new plants is expected to produce potable water for ap-

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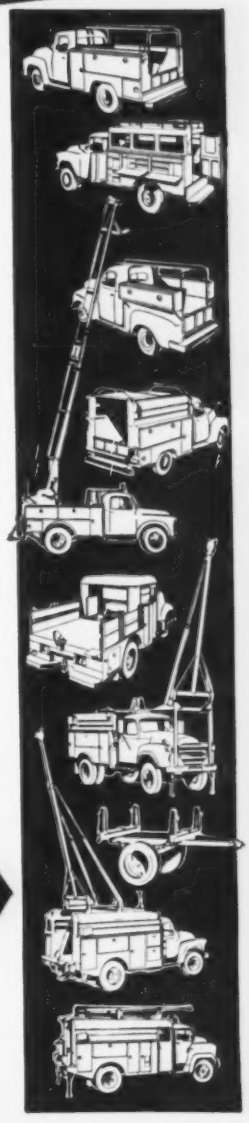

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Royal Electric Corporation
Pawtucket, Rhode Island

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proximately $1 per thousand gallons—two to three times the price most communities now pay for their water supplies.

Experts in the field report that the cost of converting sea water has been halved during the past decade and probably will be reduced an equal amount in the next 10 years. Thus commercially feasible conversion plants may appear in the late '60s.

—EW—

A nuclear-powered airplane could circumnavigate the globe about six times on just a few pounds of uranium. The conventional propeller-driven aircraft would need 7,000,000 gal of gasoline (involving 50 in-flight refuelings) to accomplish this task.

—EW—

IMPROVEMENT – Neoprene coatings on the carbon steel pump columns of two large Allis-Chalmers circulating water pumps have successfully withstood two years of rough salt water service at the El Segundo plant of the Southern California Edison Co.

Previously nickel cast iron columns were employed for this type of service. Despite a 30% higher cost, even these were not immune to salt water deterioration. Neoprene coating of steel parts appears to be another step toward the extension of intervals between shutdowns for inspection.

—EW—

FREE RIDE—The 1,700 customers of the Clatskanie PUD had a free ride in April.

For the third year the PUD gave its residential and commercial customers a month without an electric bill as a means of distributing the small utility's surplus. The gesture saved customers about $17,500.

—EW—

DEFENSE – The National Safety Council has developed a colorful 20-page booklet entitled "A Professional Code for Defensive Driving." Defensive driving is the formula for avoiding accidents. The professional driver must keep on top of all traffic situations and the booklet suggests ideas as to how this can be done. A copy may be obtained from the National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

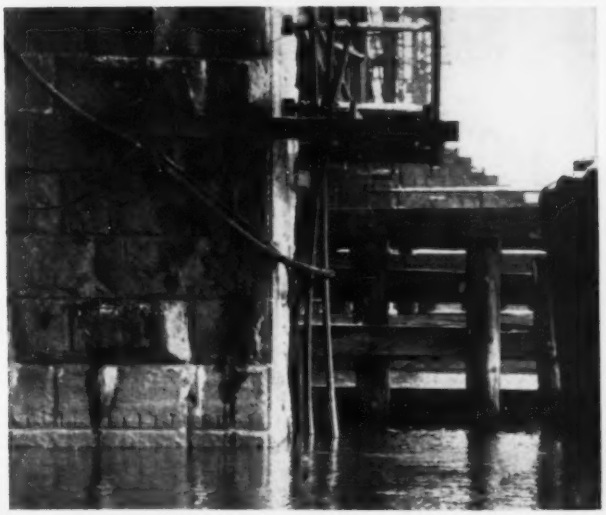
Neoprene jacket protects Simplex cable from salt water

Cable maintenance was a constant problem on 14 movable span bridges of the New York, New Haven and Hartford Railroad. Tidewater corroded the steel armor jacketing on the submarine cables (running from operator's cabin to center pier rotor motor) and eventually led to cable failure.

In 1957, Simplex Wire and Cable Company recommended cable jacketed with Du Pont neoprene to replace the original cable on the bridge shown below. The superior construction of the neoprene submarine cable has provided lasting protection from corrosion. In addition, the resilient neoprene sheath protects the cable from damage by floating ice and debris.

On the basis of this performance, the railroad plans ultimately to replace all their armored submarine cable with the neoprene-jacketed construction.

For durability and long-term economy, specify wire and cable jacketed with neoprene. For more about neoprene, write to: E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. ET-7 Wilmington 98, Del.



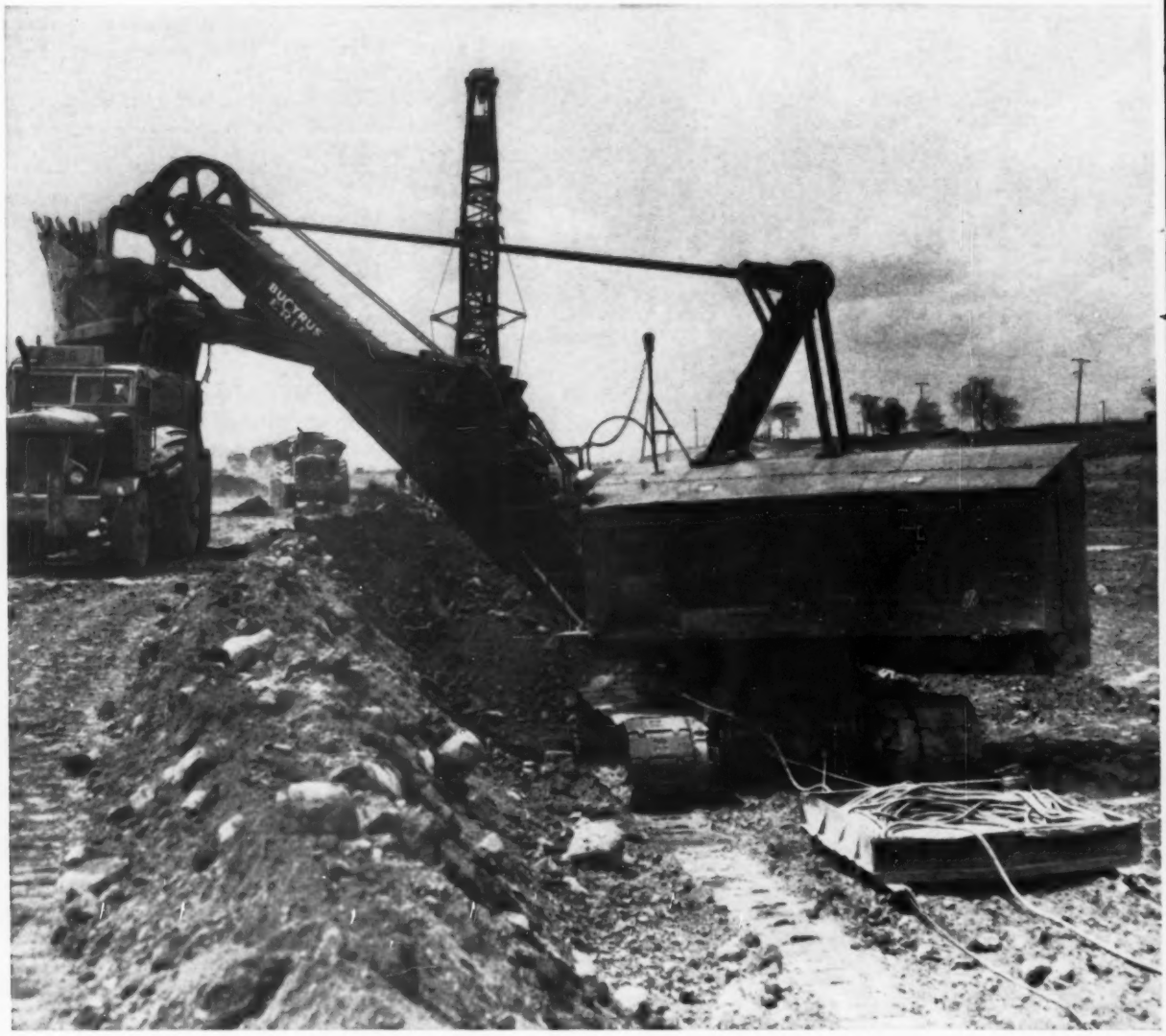
DU PONT
REG. U.S. PAT. OFF.

Better Things for Better Living . . . *through Chemistry*

SYNTHETIC RUBBER

NEOPRENE
HYPALON®
VITON®
ADIPRENE®

For phone number of closest representative see advertising index in back of book.



USS Tiger Brand Amerclad Cables are built tough and strong to withstand dragging over sharp rocks, and exposure to sun, rain, grease and oil.

Right—Strength and flexibility of Amerclad are shown by its use over this cable bridge leading to a power shovel.

Far right—Vibration resistance of the Amerclad Cable is the main reason for its use on this railroad track tamping machine.

USS **Tiger Brand Electrical Wire & Cable**

A standard cable for every special job

- Asbestos Wire and Cable
- Mold-Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

What's the difference in electrical wire and cable?

Even though electrical cables may look alike and start with some of the same materials, there's a *real difference* in the completed cables.

The difference in USS Tiger Brand Amerclad Cables results from a combination of research, engineering and construction. The development of better materials goes on constantly at American Steel & Wire. Insulation and jacketing compounds have been improved.

Better stranding designs and methods of stranding add years to cable life.

Amerclad Cables are protected by an outer jacket of Amerprene, an oil resistant compound containing a high percentage of Neoprene. Before being vulcanized, an Amerclad Cable is encased in a substantial lead sheath that is afterward removed. The pressure developed within this rigid mold during the vulcanization process produces a dense, non-porous jacket that is highly resistant to abrasive wear.

Knowledge of severe field conditions obtained through sales engineers permits designing for special conditions.

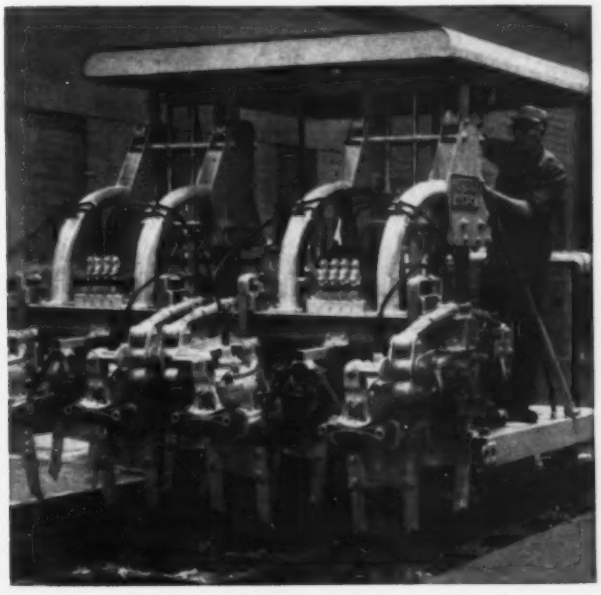
Constant effort to control quality and improved methods of inspection assure a product of highest quality.

These are a few of the unseen plus values you get when you buy Tiger Brand Amerclad Cables for your shovels, dredges, continuous miners, drills, shuttle cars and other equipment. For complete technical information, write for our free book, "Tiger Brand Amerclad Cord Cable," American Steel & Wire, Room 9159, 614 Superior Ave., N.W., Cleveland 13, Ohio.

USS, Tiger Brand and Amerclad are registered trademarks

USS American Steel & Wire Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad



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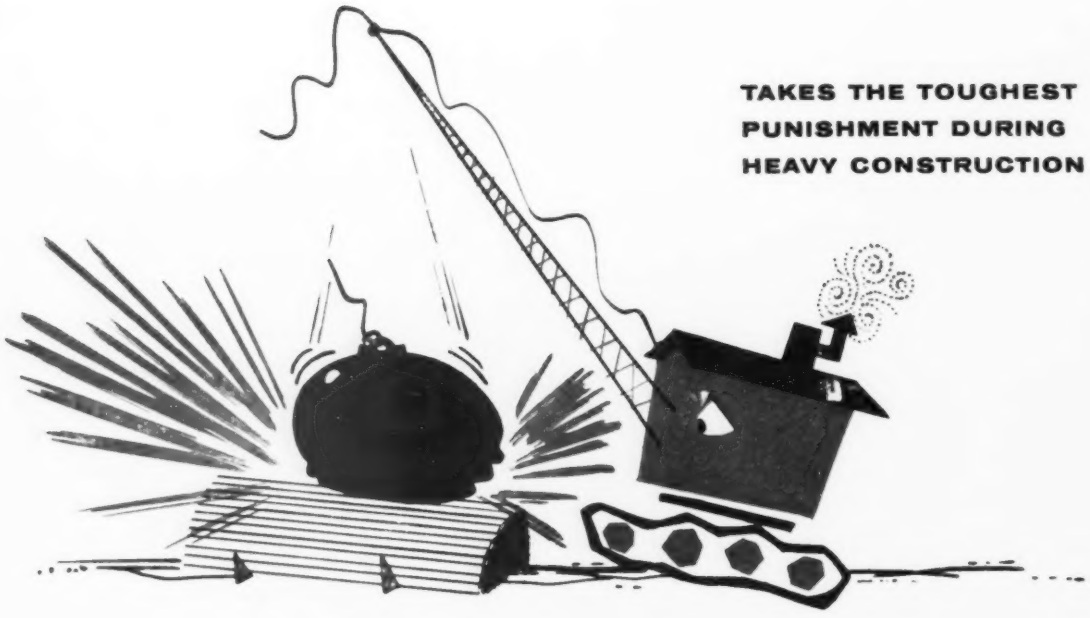


TAKES THE TOUGHEST PUNISHMENT DURING HEAVY CONSTRUCTION

this is one of the 10 reasons why

STEEL

CONDUIT IS BETTER

1 Greater inherent and structural strength
2 No special exterior preparation needed for concrete installations
3 Takes toughest punishments during construction
4 Uses standard tools and accessories
5 Easier to fish with a tape
6 Compatible with all building materials
7 Great resistance to corrosion and alkali reaction
8 Greater protection of conductors after installation
9 Immediate delivery from distributors and mills

10 Proven for more than a half a century in millions of installations

CLAYTON MARK, pioneer in electrical conduit since 1910, specializes in producing steel conduit that meets all building specifications. Our facilities, engineering and production know-how guarantee quality products accepted as "The Contractors' Favorites" in the industry—Electrictube, Hotkote, Galvakote and Enamelkote.

CLAYTON MARK & COMPANY
1900 DEMPSTER STREET • EVANSTON, ILLINOIS

Clayton Mark & Company
1900 Dempster Street, Evanston, Illinois
Please send me your booklet "Why Steel Conduit Is Better"

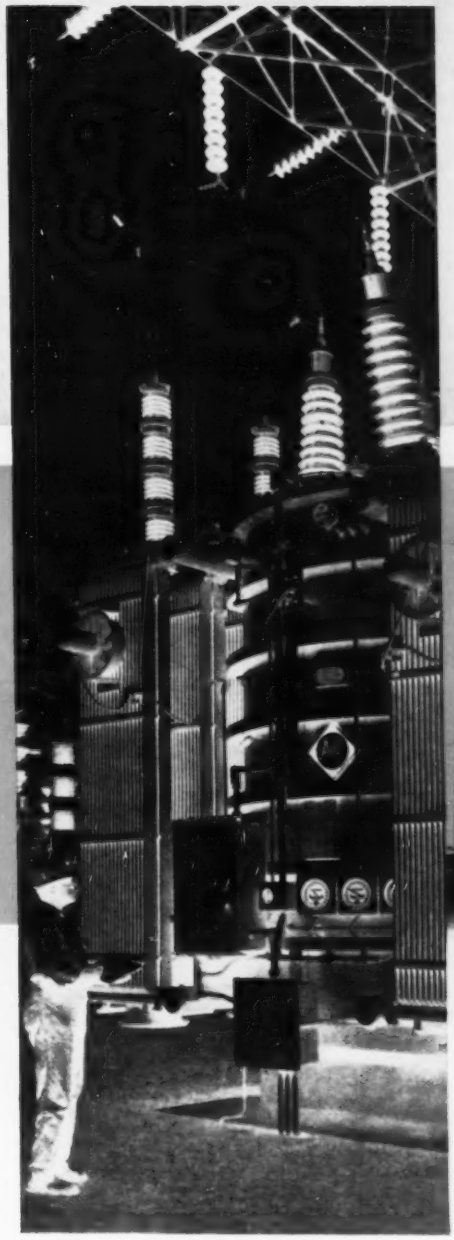
Name_____

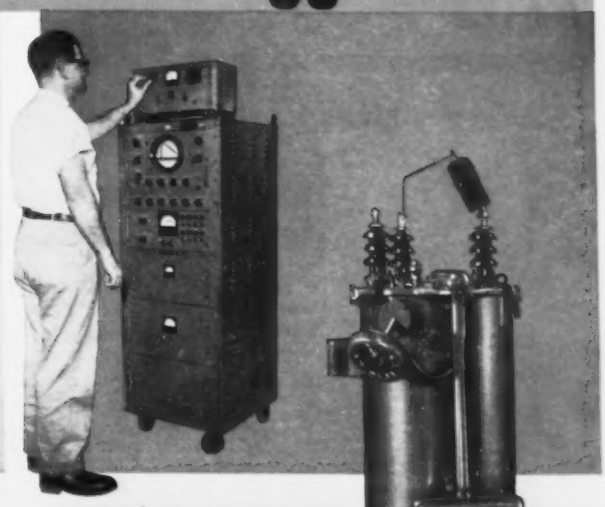
Address_____

City_____ State_____

For phone number of closest representative see advertising index in back of book.

ALLIS-CHALMERS modern line for '59





Extras...Extras...

Read all about them

It's the extras that make the difference in the electrical equipment field today! There's much standardization today, but there's still room for the designer's genius. There's still room for features resulting from research or field experience.

While you're buying — update! And to update — look for the extras. They make the difference.

Some of the extras Allis-Chalmers offers are shown on the following pages. Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A 5908 E

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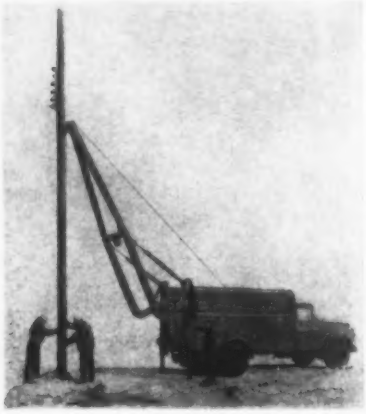
PRODUCT NEWS

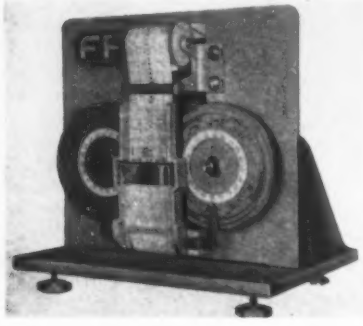
New Designs and Applications



Hydraulic Derrick

(1) *Stahl Metal Products Inc., 4750 W. 160th St., Cleveland 35, Ohio*

This company has just introduced a new hydraulic derrick for utility line trucks. Three models available, handle poles of 40-, 55- and 70-ft lengths. The derrick folds flat on the truck, roof adding only 13 in. to truck height. One man can operate the unit.



Recorder

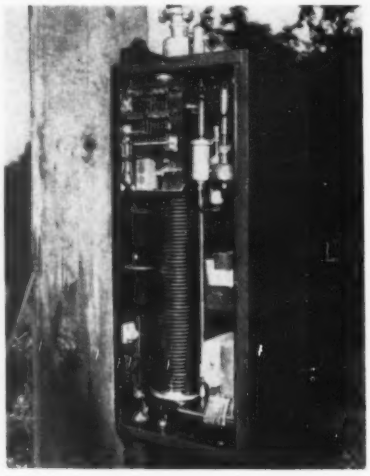
(2) *Fischer & Porter Co., 116 Jacksonville Rd., Hatboro, Pa.*

This manufacturer has developed a shaft-input analog-to-digital recorder that records analog values in binary-decimal punched tape form. The tape can be read directly or translated automatically into standard punched cards or tape for computer processing. The ADR simultaneously supplies digital information in the form of electrical contacts that may be used for telemetering. It can be operated from commercial power supplies or by battery.

Reflector Lamp Fixture

(3) *Crouse-Hinds Co., Syracuse 1, N. Y.*

A compact new vapor-tight reflector lamp fixture for greater than normal mounting heights has been developed by this company. Installation is simplified by pigtail leads in the receptacle. It takes a 300-w medium base R-40 reflector lamp or 150-w PAR-38 lamp.



Power Switch Operator

(4) *Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.*

A motor-spring mechanism is the newest power switching accessory available from this company. It is designed to make possible electrical or manual operation of three-phase sectionalizing switches with ratings of 400 and 600 amp at voltage of 7.5 through 69 kv. It is a stored energy device. An external source of 115 v a-c is required for the mechanism motor, while the mechanism has a self-contained d-c power supply for the release linkage. This self-contained d-c power permits switch operation under emergency as well as normal conditions. Can be operated remotely or locally.

Aerial Platform

(5) *Strato-Tower Division, Young Spring & Wire Corp., Box 103, Elkhart, Ind.*

A new aerial platform series offered by this company is designed specifically for use in globe cleaning and street lamp replacement. Featured is a complete unit including truck chassis, aerial platform and special utility body designed to provide efficiency for one-man operation. A two-man operation unit is also available.

Capacity Increase

(6) *General Electric Co., Schenectady 5, N. Y.*

This company announces a new in-

ALLIS-CHALMERS modern line for '59

. . . simpler regulator control

- Provides more accurate settings
- Saves operator's time
- Eliminates customer complaints

Now when you adjust or test voltage level and band width there's no need to change customer voltage. No more customer complaints of high or low voltage. With *Caliband* control the job is simpler than ever before. Adjusting a single knob is all it takes . . . operator's time for accurate settings is greatly reduced.

CALIBAND control demonstrated

Caliband control is so simple it can be demonstrated and explained at your desk with an actual unit in a small portable kit. Contact your nearby A-C office for a demonstration, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Caliband is an Allis-Chalmers trademark.

ALLIS-CHALMERS
Originators of 5/8% Step Regulators
A-5912

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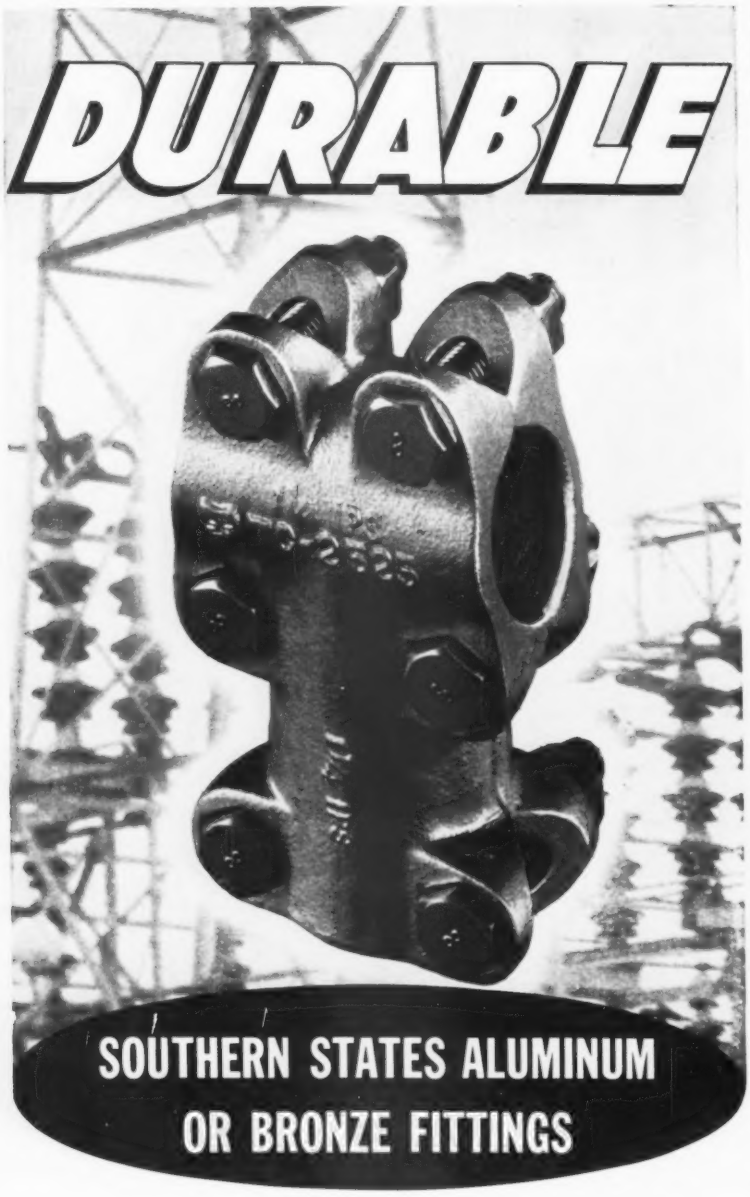


Knowing that fittings are often re-used, Southern States has designed its entire line with easy, on-the-job assembly and re-assembly foremost in mind. Southern States connectors and bus supports have recessed hexagonal bolts, assuring easy and rapid "one-wrench" installation or removal. Each connector fits properly, has ample strength, and is sufficiently rugged at stress points. *Never underestimate the importance of a good connection!*

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

sulation system for transformers that will permit peak loads to be increased an additional 20% of transformer rating with no sacrifice in life expectancy. Ratings in the new line of transformers will be available up through 167 kva. New plastic coating that insulates the transformer covers from accidental shorting by birds and squirrels and reduces other service outages and corrosion is a feature. Other features are higher light and breaker settings for self-protected units, improved cover-mounted bushings designed so the internal fuse can be replaced without removing the bushing and a rolled-under base that will minimize damage from scraping.

Hot-Stick Tester

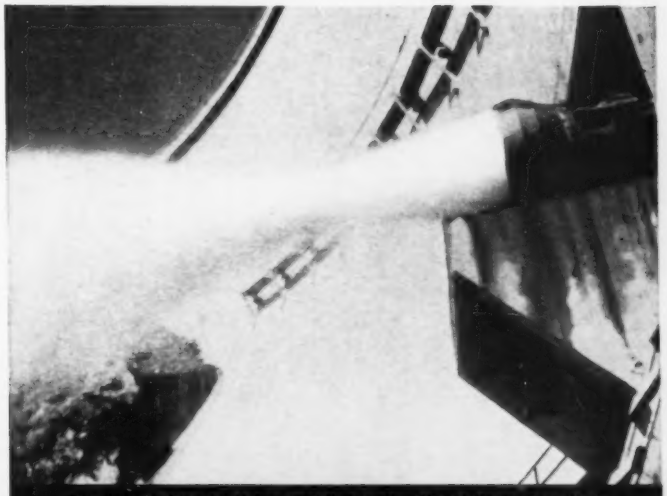
(7) *A. B. Chance Co., Centralia, Mo.*

A device for testing insulated tools is offered by this company. Designed for 110-v, 60-cycle a-c circuits, the tester can be plugged into standard electrical outlets or used on the job by running an extension cord to the secondary. All types and sizes of hot sticks, regardless of insulated material, can be tested on this unit. It measures true leakage, independent of stray capacitance currents, and operates at ambient temperatures up to 105 F.

Gold Transformers

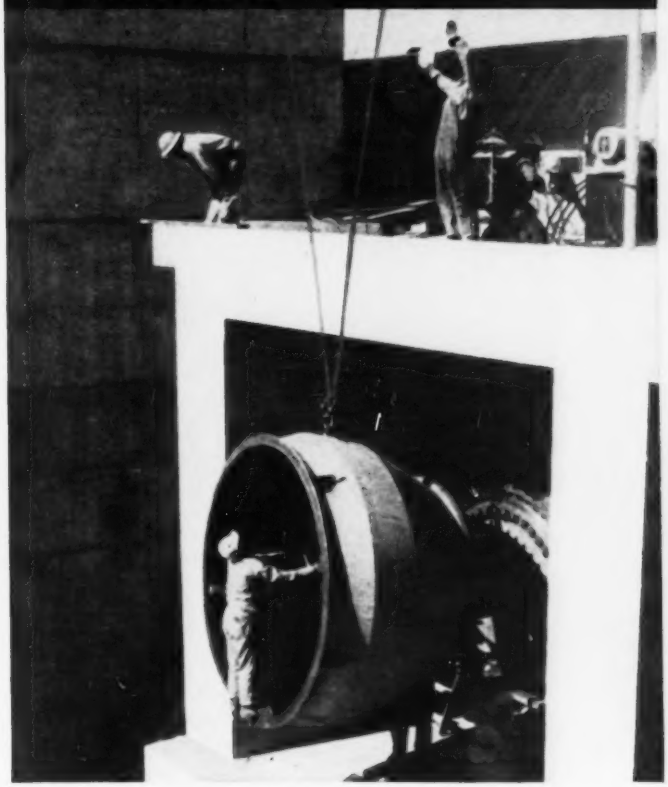
(8) *Kuhlman Electric Co., Birmingham, Mich.*

"Perma-Gold" transformers are now available to utilities for service to Medallion Homes in their distribution systems. The transformer matches the color of the gold plaque displayed on all-electric homes.



This 18-inch Ring-Jet Valve, installed by the City of Bremerton, Washington, is manually operated. Under a 115-foot design head, it discharges 76 MGD when fully opened. Note how the hood concentrates the discharge stream.

One of two 66-inch A-C Ring-Jet Valves during final assembly at Tulloch Dam, California. These valves are used for an irrigation bypass, operate under a 145-foot head.



RING-JET VALVES

for easy regulation and control of water under free discharge

Allis-Chalmers Ring-Jet Valves are a logical development from the Howell-Bunger Valve. For use under high- and low-head, free-discharge conditions, the A-C Howell-Bunger creates a substantial amount of spray in providing maximum dispersion to minimize erosion. Now, in the A-C Ring-Jet Valve, the addition of a steel hood creates a concentrated jet, reduces spray, and helps dissipate the energy in the discharged water.

This new A-C Ring-Jet Valve gives you the simple construction, radially-balanced hydraulic design and easy operation of the A-C Howell-Bunger Valve, while very nearly matching its high discharge coefficient. Ring-Jet Valves are available with standard manual and/or motor-driven operators. Hydraulic operation can be provided, and is especially applicable to the larger sizes and higher head applications.

To obtain complete information on the A-C Ring-Jet Valve, contact your nearest Allis-Chalmers office, or write Allis-Chalmers, Hydraulic Division, York, Penna.

Hydraulic Division RESEARCH DESIGN HYDRODYNAMICS ENGINEERING FABRICATION

Hydraulic Turbines & Accessories • Pump-Turbines • Pumps • Liquid Heaters
Rotovalves • Ball Valves • Butterfly Valves • Free-Discharge Valves

AC ALLIS-CHALMERS

ALLIS-CHALMERS

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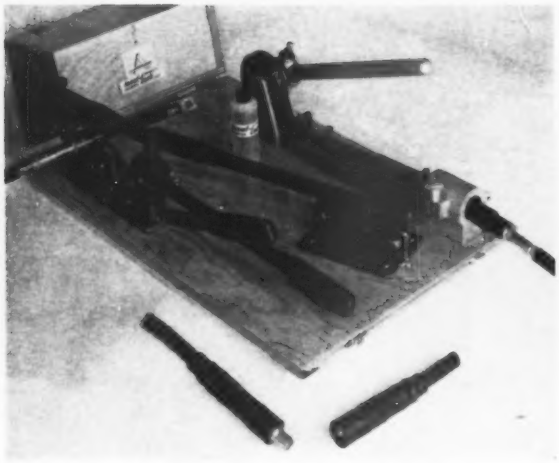


Portable Repair Kit

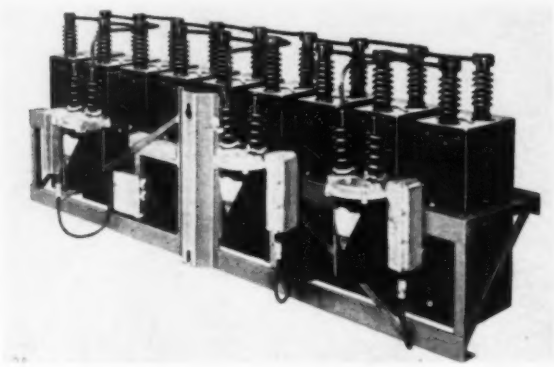
(9) *F. M. Anthony Co., 773 University Ave., Berkeley 10, Calif.*

This company offers a portable welding and power cable repair kit that includes a circumferential crimping tool, cable cutter and insulation mounting tool. Completely hand operated, the kit uses no heat, no power attachments, dies or molds. Flexible cable sizes No. 4 through 500 mcm may be fabricated, maintained and repaired. Terminal lugs, splicing connectors and threaded cable tips are cold rolled and compressed into the connector and the cable conductor by a patented process employing three rollers mounted in an adjustable frame.

Microfilm Printer

(10) *Minnesota Mining & Mfg. Co., 900 Bush Ave., St. Paul 6, Minn.*

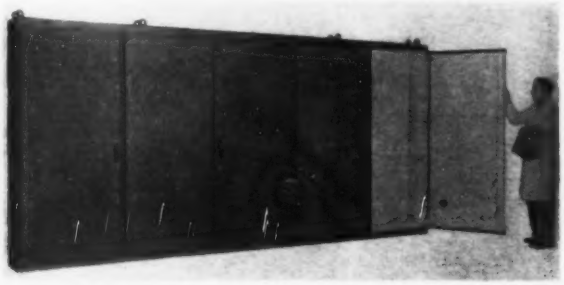
A machine that makes prints up to 18x24 in. of engineering drawings and other detailed documents from microfilm, completely automatically, is announced by this manufacturer. A unit is both a reader and a printer in a single unit. A unit accommodates 35-mm microfilm in aperture cards for tabulating card sizes. Cards are inserted in the machine, a button is pressed, and the enlarged copy appears in 15 seconds or less. A masking control permits selective printing of full or half-size prints.



Capacitor Racks

(11) *Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.*

Single row and cluster-type racks for 100-kvar capacitor units are offered by this manufacturer. Single row racks can accommodate 300, 600 or 900 kvar while cluster-type racks can accommodate 600, 900 or 1,200 kvar. These racks can be direct pole mounted or pole bank mounted by means of an optional accessory. Both types of racks are fabricated of lightweight aluminum.



Control Enclosures

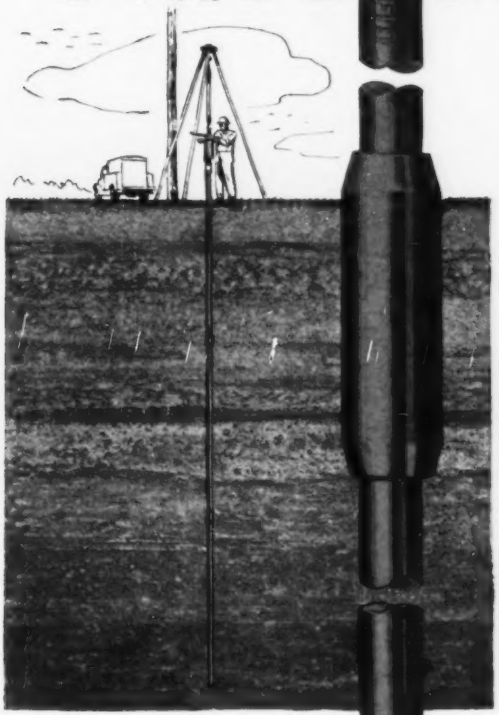
(12) *Hoffman Engineering Corp., Anoka, Minn.*

Multidoor control panel enclosures are now offered in standard sizes by this company. Made to NEMA type 12 and JIC electrical standards, the units have three, four and five doors. They are 86 in. high and 14 in. deep and range up to 187 in. in length, depending on the number of doors. The enclosures are said to be completely oil and dust tight. Doors have neoprene gaskets and all seams are welded. Behind each set of doors there is a removable panel for mounting electrical controls.

(For more information about the products on these pages, fill in the coupon on p 26.)

DRIVE DEEP WITH Copperweld®

sectional ground rods

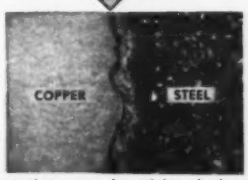


Don't jeopardize your overhead line performance by skimping on ground rods. You can achieve reliable, low-resistance ground connections by driving Copperweld Sectional Ground Rods deep into the earth's sub-surface where there are good conducting soils. And by measuring resistance after each sectional rod is driven—allowing for seasonal variation—you can make sure of permanent grounding protection.

Drive deep with Copperweld! You'll improve line performance, promote safety, avoid damage, and assure uninterrupted service.

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

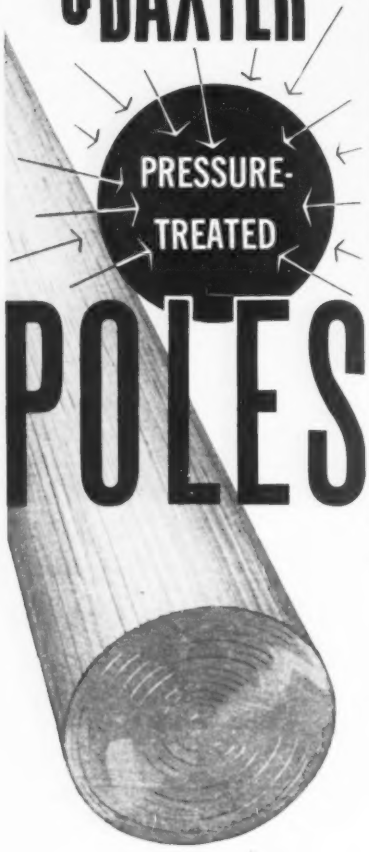
YOU'RE POSITIVE WITH THE MOLTEN-WELD



This microphotograph of the weld area of Copperweld Ground Rods shows how the grains of copper and steel alloy to form a permanent, continuous weld. No other process achieves this inseparable union.

For phone number of closest representative see advertising index in back of book.

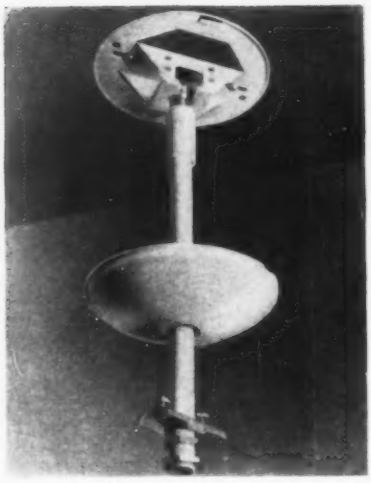
McCORMICK & BAXTER



Years of extra service are processed into our straight, strong Douglas Fir poles. Machine-peeled, incised and full length pressure-treated with either Penta or Creosote. Available from stock in Portland, Oregon, and Stockton, California.

McCORMICK & BAXTER
CREOSOTING COMPANY

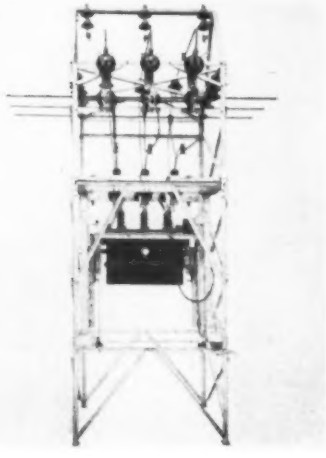
P. O. BOX 3344 • PORTLAND, OREGON
•
485 CALIFORNIA STREET
SAN FRANCISCO, CALIFORNIA
144 N. BROADWAY
GLENDALE, CALIFORNIA



Fixture Hanger

(13) *Columbia Electric & Mfg. Co., 2310 N. Fancher Way, Spokane 10, Wash.*

A new swivel hanger for a free swing of 100° has been added to this company's lighting fixture equipment. The company reports that it has been classified as "earthquake-proof" by testing laboratories. Included is a built-in leveling device with a visual scale for adjustment after the fixture is hung. Standard length is 24 in. and other lengths are available on order.



Substation Unit

(14) *Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.*

A new open-type unit structure offered by this company is said to simplify construction of substations by combining the secondary bus, oil circuit recloser, by-pass switches, arresters and outgoing circuit attachment into one compact assembly. Units are rated for use on lines having phase-to-phase voltages up to 15 kv. Kyle type R or W reclosers can be installed in the new unit. Thus, interrupting capability up to 200 mva is available and circuits can serve continuous loads of 560 amp per phase. BIL is 110 kv.

Service Equipment

(15) *Wadsworth Electric Mfg. Co., Covington, Ky.*

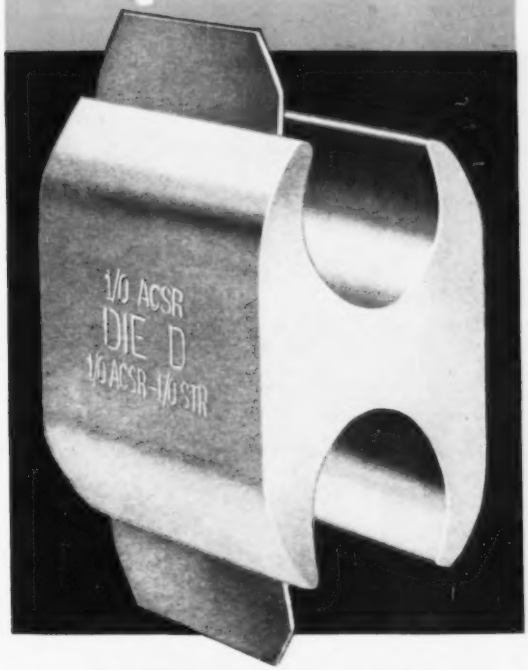
This new 200-amp fusible main service equipment has a door-operated main switch. It is three pole, two fuse, solid neutral (mounted directly on cabinet), 120-240 v a-c. The equipment has three fuse units. Two are 60 amp and one 30 amp. It also has 12-, 16- or 20-plug fuse receptacles which may be used for 240-v heater circuits or 125-v lighting and appliance circuits. Available with either surface or flush mounting cabinet.

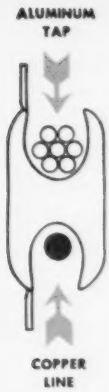
Aerial Lift

(16) *Truck Equipment Co., 3963 Walnut St., Denver 5, Colo.*

A new series of completely hydraulically operated aerial lifts is announced by this company. These mobile units mount on standard truck chassis and are capable of placing overhead worker to a height of 100 ft. Boom is a two-stage telescoping design that mounts on the truck in transport position and erects rapidly to desired position. Outriggers are included. Fiber glass basket is completely insulated.

new! KEARNEY DOUBLE-TAB SQUEEZON





Exclusive Kearney design permits either groove to be used for line or tap. Diagram illustrates Double Tab Squeezon used to make an aluminum "step-up" tap to copper line connection.

NOW! The Easiest Way to Make Both "Step-Up" and "Step-Down" Tap Connections on All Combinations of Copper, Aluminum and ACSR

The newest, most versatile Squeezon Compression Connector. Dual, fully open groove design, exclusive with Kearney, eliminates need to thread tap conductor through fitting. Use *either* groove for line or tap . . . make "step-up" or "step-down" tap connections quickly and easily. Double Tab Squeezons speed up deadending, too. Form the loop . . . drop the conductors into the open grooves . . . and compress! On insulated wire, remove only a "Squeezon-length" of insulation!

Available in a range of size combinations for aluminum, copper or ACSR. (Write for Selector Card.) Individually packaged in handy "Snap-Open" boxes; grooves factory-filled with Kearnalex inhibitor and contact aid.

REVERSIBLE
The only compression connector with built-in spacer that makes *BOTH* "step-up" and "step-down" tap connections, from copper to ACSR, aluminum to ACSR, or aluminum to copper.

MASSIVE SPACER
Separates conductors . . . eliminates strand cutting . . . and aids in the prevention of galvanic corrosion between dissimilar conductors.

SECONDARY DEADENDING
Faster, easier. No threading through . . . form the loop, position Squeezon and compress! On insulated wire, strip only enough insulation to make the connection.

"SNAP-OPEN" BOX
Individually packaged. Box snaps apart along perforated line . . . INSTANTLY, CLEANLY . . . even with gloves! No stripping, no peeling.

NO DISTORTION
Squeezon groove jaws completely encircle conductor when compressed . . . provide dependable long-line, full circumference contact without distortion or damage to conductor.

for better construction . . . safer maintenance . . . specify KEARNEY products

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

PLANTS AT: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

IN THE WEST: for prompt service, contact Kearney's West Coast Distributor, **Maydwell and Hartzell, Inc.,**
Los Angeles • Seattle • Portland • San Francisco • Spokane • Phoenix.

LIGHTWEIGHT K/W ALUMINUM INITIALLY, CUTS

Costs 20% less than copper with equal current carrying capacity!

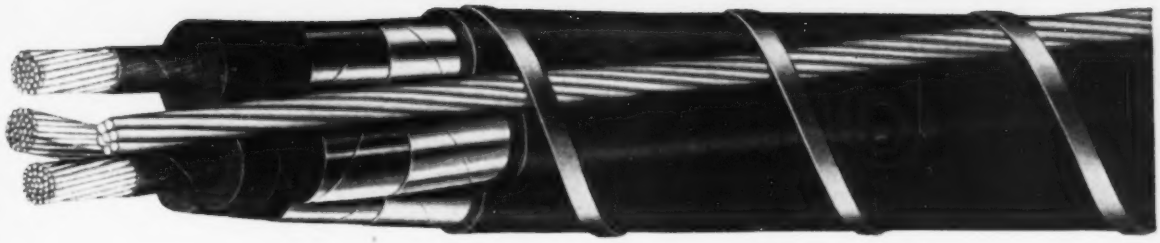
SIMPLE CONNECTIONS

Reverse lay provides simple and fast connections because the conductors can be easily separated to make taps and connections. Tapping can be accomplished quickly, safely and easily.

REDUCES TREE TRIMMING

Unlike open wire construction, compact preassembled KW aerial cable cuts tree trimming to a minimum, initially and periodically. Result: fewer service interruptions or outages during storms, less maintenance.

AERIAL CABLE COSTS LESS INSTALLATION COSTS



FASTER INSTALLATION

Due to its light weight, aluminum aerial cable can be installed to the same sags as copper cable, provides as much clearance, and reduces the tension at pole supports. Additionally, this reduced weight in some cases permits reduction of the messenger size. Less congestion on poles; decreased pole height when used for joint construction with telephone company; improved voltage regulation due to reduced reactive drop.

SAVE on first costs, save on labor and maintenance expenses now with KW aluminum aerial cable. KW preassembled aerial cable is available in both reverse lay and unilay in either aluminum or copper. For immediate service or more detailed information, call the Kaiser Aluminum sales office or KW distributor listed in your telephone directory.

Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, California.

KAISER ALUMINUM

"IF IT CARRIES CURRENT, KW CARRIES IT!"

See "MAVERICK" • Sunday Evenings, ABC-TV Network • Consult your local TV listing.

For phone number of closest representative see advertising index in back of book.

ANOTHER NEW

EAGLE Easy-Wiring Trouble-Free Device

COMBINATION SINGLE POLE SWITCH AND U GROUND RECEPTACLE

Specification Grade

No. 991
Brown & Ivory

Switch Rating
10A-125V "T"
5A-250V

Receptacle Rating
15A-125V

Underwriters' Listed

This latest addition to the Eagle combination line incorporates the new U Ground Receptacle to accommodate a 3 wire grounded appliance for maximum safety.

- Will also accept any 2 wire plug.
- Outlet can be wired independently of, or controlled by, switch.
- Heavy Phosphor bronze "T" contacts insure life-time satisfaction.
- Heavy duty switch is "T" rated.
- Switch and receptacle on same circuit; common terminal marked "+line".
- Green color terminal to ground.
- Equipped with 7/8" screws with starting die points and plaster cleaning threads, mounted on straps.
- Wiring diagram on each individual box.

Send for Free Literature on Eagle Combination Devices.

SPECIFY EAGLE
ACCEPT NO SUBSTITUTES

"Perfection is not an Accident"
EAGLE ELECTRIC MFG. CO., INC.
LONG ISLAND CITY 1, NEW YORK

BULLETINS ETC.

(17) **SLIDE TALK**—A new program utilizing color slides to explain "Certified Inspiration Lighting" to electrical distributors and contractors is offered by Thomas Industries Inc., 410 S. Third St., Louisville 2, Ky. The local sales representative of Thomas Industries will have the slide presentation.

(18) **SUBSTATION TRANSFORMERS** — Bulletin GEA 5452A, available from General Electric Co., Schenectady 5, N. Y., describes the company's new power master substation transformers rated single-phase, 500 kva and below, 15 kv and below, for use in distribution and industrial substations.

(19) **INSULATED LEADS**—A new booklet available from Rome Cable Corp., Rome, N. Y., discusses the particular insulation properties required for oil-immersed transformer leads and compares these requirements with the properties of Synthinol 901, a PVC compound developed by Rome Cable.

(20) **ELECTRICAL DATA**—Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa., is offering a new booklet called "Convenient Tables and Formulas." It contains convenient tables, formulas and graphical symbols summarizing electrical data, properties of materials, heat transfer and steam information, measurements and other subjects.

(21) **DISCONNECT SWITCHES** — Hook-operated disconnect switches are described in bulletin No. PSE8, released recently by Line Material Industries, Milwaukee 1, Wis. Design features of three types of disconnect switches plus dimensions and mounting details are outlined.

(22) **INDUSTRIAL FIXTURE** — A two color-catalog offered by the AllBrite Division of Curtis-AllBrite Lighting Inc., 352 Shaw Rd., South San Francisco, Calif., describes the company's new Power Groove Industrialist for VHO, SHO and Power Groove lamps. Now with 30° x 30° shielding provided by matching louver, the fixture comes in 48-in. and 96-in. two-lamp models with porcelain enamel reflectors.

(23) **PROCESS HEATERS**—A new 64-page catalog offered by Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa., illustrates the complete line of Chromalox electric process heaters and describes their application. A technical section aids in accurate calculation of heating requirements. Ask for catalog 60.

(24) **PORTABLE GENERATORS**—Utility applications of portable, mobile and standby electrical generating plants manufactured by D. W. Onan & Sons Inc., 2515 University Ave., S. E., Minneapolis 14, Minn., are described and illustrated in a booklet called Power Points Digest now available.

(25) **ALUMINUM CONDUIT**—The story of the entry of Pittsburgh Standard Conduit Co. into the aluminum rigid electrical conduit field is carried in a booklet offered by the company. Address your request to Verona, Pa. Ask for "What About Aluminum Conduit?"

KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good after September 1

Please send me, without obligation, the new product information or catalogs:

If described in Product News, circle item number

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14 15 16 17 18 19 20 21 22 23 24 25

If described in advertising, fill in page number

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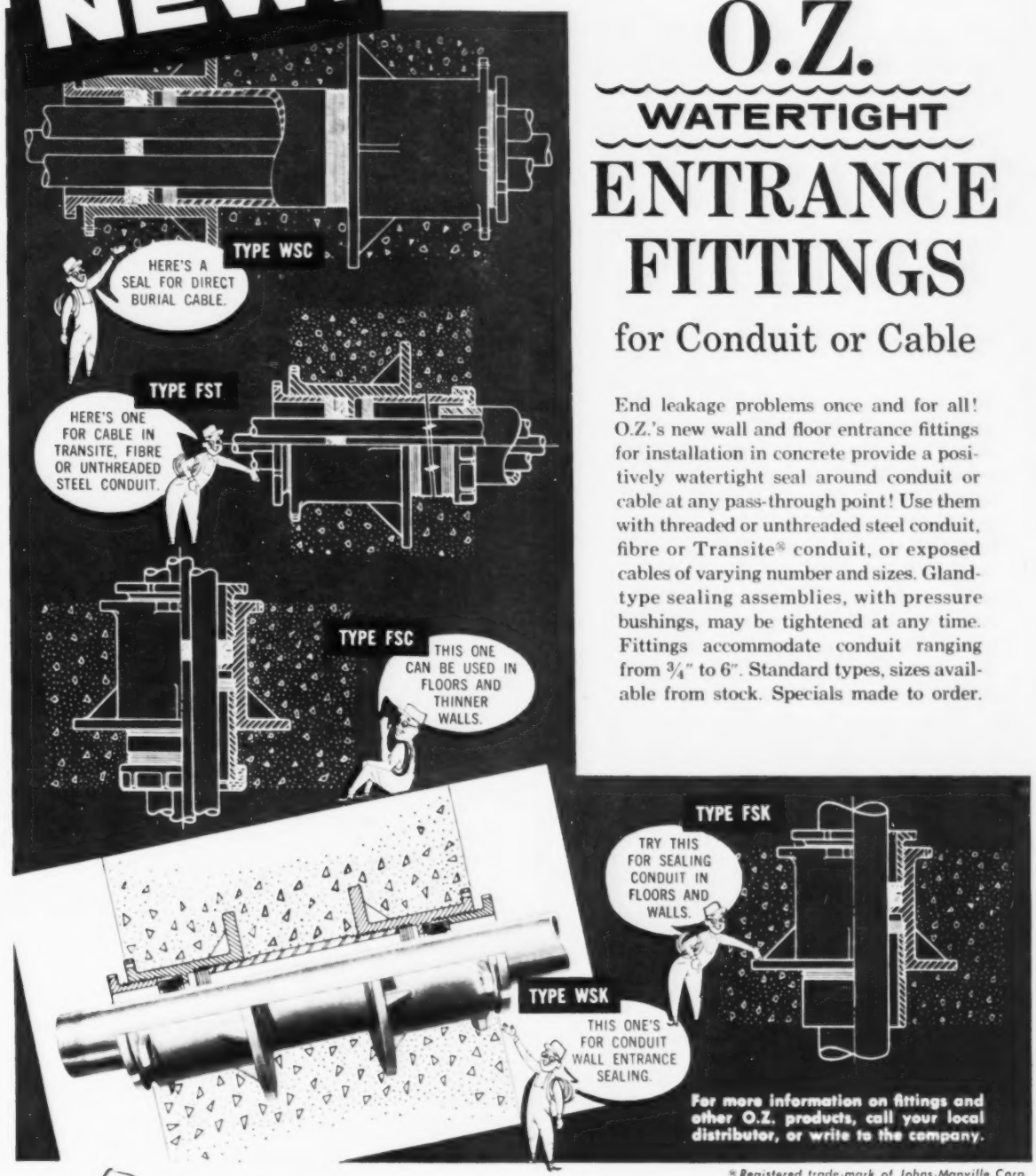
*Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

NEW! a complete line of O.Z. WATERTIGHT ENTRANCE FITTINGS for Conduit or Cable

End leakage problems once and for all! O.Z.'s new wall and floor entrance fittings for installation in concrete provide a positively watertight seal around conduit or cable at any pass-through point! Use them with threaded or unthreaded steel conduit, fibre or Transite® conduit, or exposed cables of varying number and sizes. Gland-type sealing assemblies, with pressure bushings, may be tightened at any time. Fittings accommodate conduit ranging from ¾" to 6". Standard types, sizes available from stock. Specials made to order.


TYPE WSC
HERE'S A SEAL FOR DIRECT BURIAL CABLE.
TYPE FST
HERE'S ONE FOR CABLE IN TRANSITE, FIBRE OR UNTHREADED STEEL CONDUIT.
TYPE FSC
THIS ONE CAN BE USED IN FLOORS AND THINNER WALLS.
TYPE FSK
TRY THIS FOR SEALING CONDUIT IN FLOORS AND WALLS.
TYPE WSK
THIS ONE'S FOR CONDUIT WALL ENTRANCE SEALING.

For more information on fittings and other O.Z. products, call your local distributor, or write to the company.

® Registered trade-mark of Johns-Manville Corp.

O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

- CAST IRON BOXES
- CABLE TERMINATORS
- POWER CONNECTORS
- SOLDERLESS CONNECTORS
- GROUNDING DEVICES
- CONDUIT FITTINGS
- INTERLOCKED ARMOR CABLE FITTINGS

Sales Office and Warehouse: 406 So. Cicero Avenue, Chicago 44, Ill. • ESterbrook 9-0326
Office and Factory: 749 Bryant Street, San Francisco 7, Calif. • GArfield 1-7846

For phone number of closest representative see advertising index in back of book.

Question:

How does Duquesne Light Company approach the problem of locating 23 kv substations in closely built-up residential areas?

Answer:

By using completely metalclad substations with S&C metal enclosed fused load interrupter switchgear developed cooperatively by Duquesne and S&C; and by putting the 23 kv and 4 kv circuits underground (as shown at right).

3-bay S&C switchgear unit for primary of Duquesne Light Company substation.

Q: Why is S&C metal enclosed fused load interrupter switchgear suited to substations in closely built-up residential, commercial, and industrial areas?

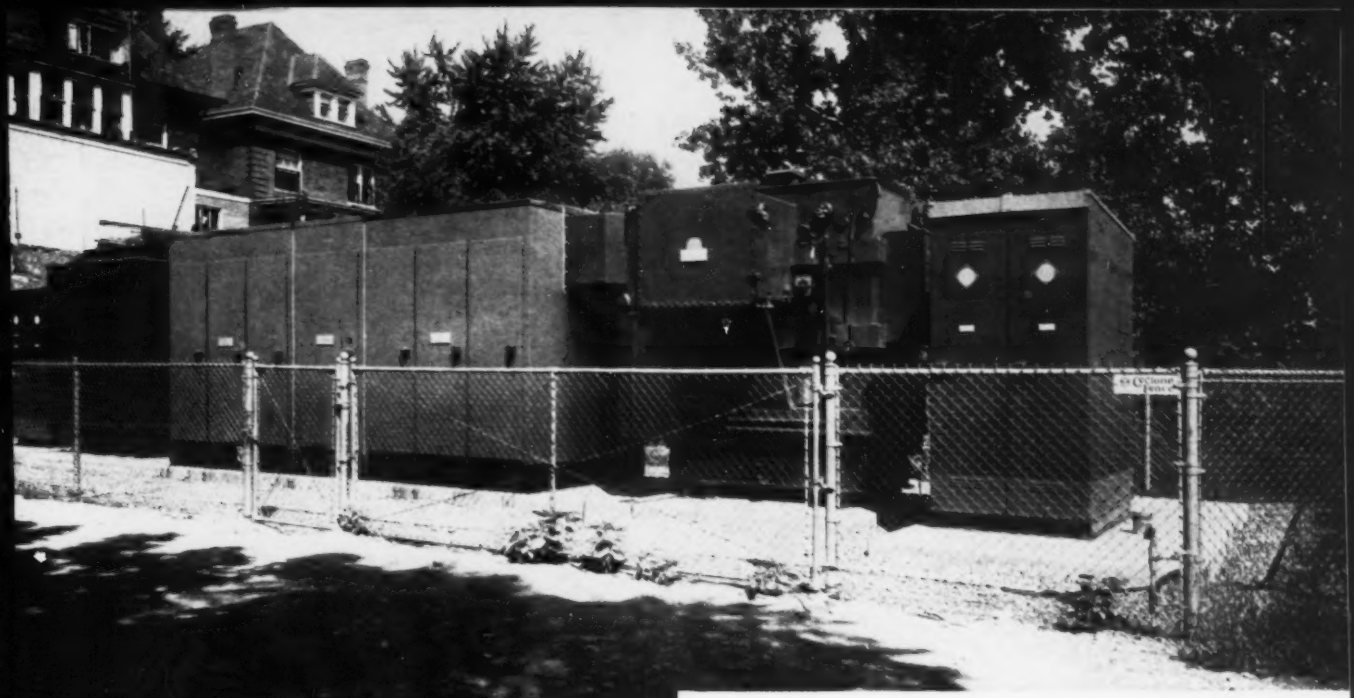
A: Because it gives safety to the public, attractive appearance, and compactness.

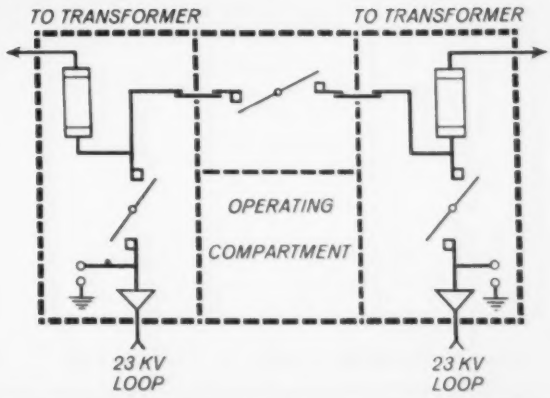
Q: How is attractive appearance achieved?

A: By eliminating steel structures or wood poles, exposed switches, potheads, fuses, and lightning arresters. This gear is also streamlined so that a Duquesne substation offers a low silhouette which fits unobtrusively into its surroundings.

S&C

Specialists in High-Voltage Circuit Interruption





Q. What does compactness mean to Duquesne?

A. Large sites are not required for these substations, thus the difficulty of site procurement, not to mention the cost, is significantly reduced.

Q. Why was S&C chosen to participate with Duquesne in this cooperative program to develop a completely metal-enclosed 23 kv substation?

A. Because S&C had developed compact load interrupters for arc-free switching, as well as a correspondingly compact power fuse with controlled exhaust—both ideally suitable for metalcladding.

Q. How can utilities learn more about the use of S&C metal-enclosed fused load interrupter switchgear?

A. Write for additional information to S&C Electric Company, 4425 Ravenswood Avenue, Chicago 40, Illinois. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 18, Ont.

S&C METALCLAD FUSED LOAD INTERRUPTER SWITCHGEAR

New ORANGEBURG® CA* CONDUIT *with Flush Coupling Attached!*

With no separate couplings to handle or attach on the job, Orangeburg CA lays faster, costs less to install. Each long, light length has a *flush* coupling attached at one end and a standard 2° male taper at the other end, making installation a simple, one-step operation. And, since the coupling *is* attached, there are no coupling cartons to warehouse or carry to the job.

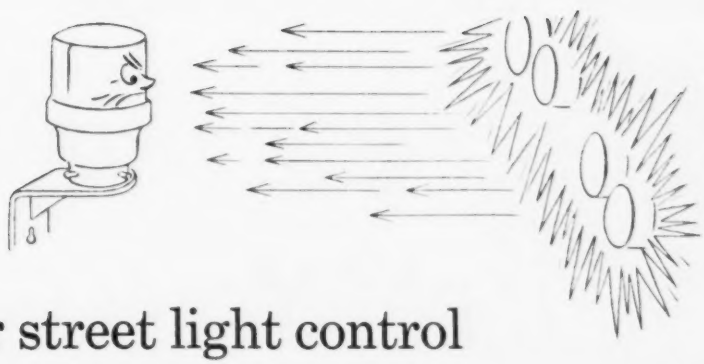
What's more, with the coupling *flush* to the conduit's outside wall, new CA is easy to stack, store and handle. The flush coupling also eliminates "staggered" joints in the trench. And that means real savings in cutting and tooling time.

Like the hundreds of millions of feet of Orangeburg fibre conduit in use since 1893, new CA has self-sealing joints and impermeable walls. Its smooth, 100% fibre raceway adds years to cable life.

New Orangeburg CA is available in 2", 3", 4", 4½" and 5" sizes. Orangeburg Standard and Nocrete Conduit, with separate sleeve couplings, are available as always. Write Dept. WE-79 for Catalog 52.

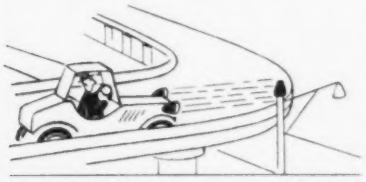
ORANGEBURG MANUFACTURING CO.
Orangeburg, New York • Newark, California
A Division of The Flintkote Company, Manufacturers of America's Broadest Line of Building Products

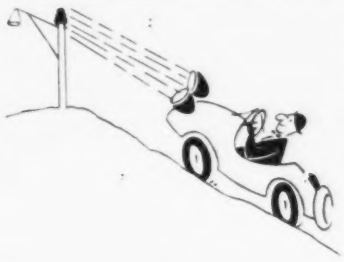
Orangeburg Fibre Conduit is distributed by Graybar Electric Co. and General Electric Supply Co. with branches and stocks in principal cities.
For phone number of closest representative see advertising index in back of book.



When your street light control sits right in the path of somebody's headlights..

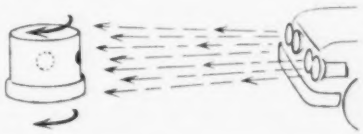
. . . the photoelectric control may switch and turn off the streetlight — IF the headlights are bright enough, come close enough and the control looks them straight in the eye.



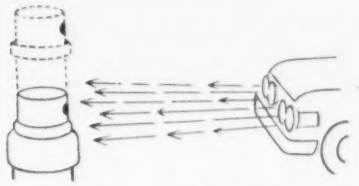


In the majority of cases, though, this problem never comes up because the control sits 30 feet in the air, well above the confusion of headlights. But in those rare instances where it *might* happen, here's why there's no cause for alarm.

With Fisher-Pierce photoelectric controls, the key to the problem of bright transients lies in their distinct *directional* nature. It so happens that this is one of the reasons we make our controls directional — so they *can* look away from the source of confusion. And that is also one of the answers: turn the control around a little so its photosensitive element doesn't get the full, four-light, high-beam benefit of Detroit's latest creations.



Solution #2 depends on the "flat top" characteristic of most headlight beams, and is practically as easy as number 1: raise the control just enough to put it a whisker above the beams. In some cases this may turn out to be only a foot or so.



Some control installations (e.g., on luminaires) won't permit any change in the height of the control, so re-orientation is the answer. And when you depart from the generally northward orientation of F-P controls, you've got 90° to play with between NW and NE.

We know this works because we tried it, and the only surprises were how little re-orientation or height-changing did the trick. The automobiles used had four good bright headlights apiece, the controls were 6600A types, and just to get an idea of the light levels involved we made readings at the control with an illumination meter. When the car got within about 50 to 60 feet of the control, coming head on with the control at the exact level of the headlights, the control saw enough light to turn off. But in every case, either re-orienting or elevating the control prevented turn-off. We even tried it with the headlights only 10 feet away — which put 160 foot-candles on the control — and 12 inches of control-raising stopped the turn-off.

That's our story on the headlight problem, put in print because it does concern some people. We've never heard of a situation that can't be remedied by one method or the other. But if you run into one, we'd like to hear about it and help if we can. These new headlights are bright, all right —

but we think the people who put up the controls are a lot brighter. The Fisher-Pierce Co., 43 Pearl Street, So. Braintree 85, Massachusetts.

FISHER PIERCE

PHOTOELECTRIC LIGHTING CONTROLS

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

For phone number of closest representative see advertising index in back of book.

TRIPLEX CABLE

cuts installation problems

...COSTS, TOO!

Triangle's Triplex Neutral-Supported Secondary Cable with the built in messenger offers the utility considerable advantages for semi-rural and housing development applications. Because it is self-supporting, longer spans can be used, requiring fewer poles. Crossarms are not needed. Midspan tapping permits direct runs from house to line, allowing by-passing of trees and other obstructions.

Triplex has a high resistance to wind and ice loading, and gives good protection against sunlight, heat, moisture, corrosive atmospheres and abrasion. It is available in several combinations of insulations and messengers.

Triplex Neutral-Supported Secondary Cable is just one of the new full line of Distribution and Service Cables described in the new Triangle Catalog. A request, on your letterhead please, will bring your copy to you.

Buy right—buy from your distributor

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

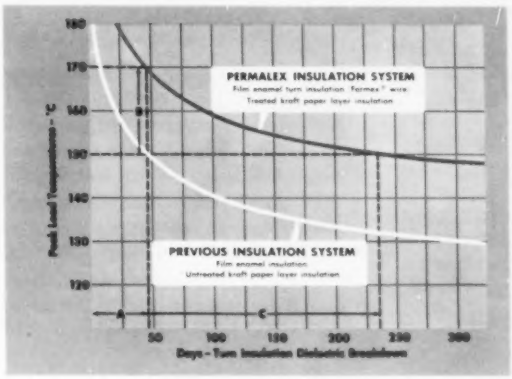
"It MUST Be Right!"

For phone number of closest representative see advertising index in back of book.

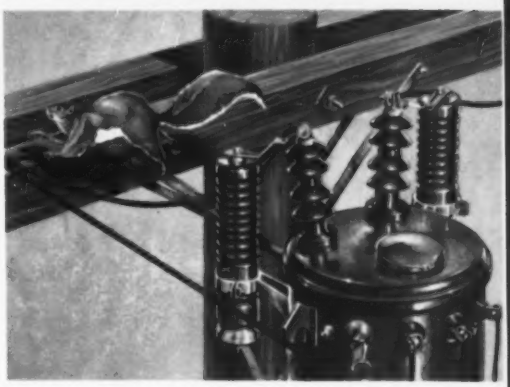
GENERAL ELECTRIC ANNOUNCES . . .

NEW 1959 Distribution Transformer

NEW Permalex* insulation permits 20% additional load with full transformer life.



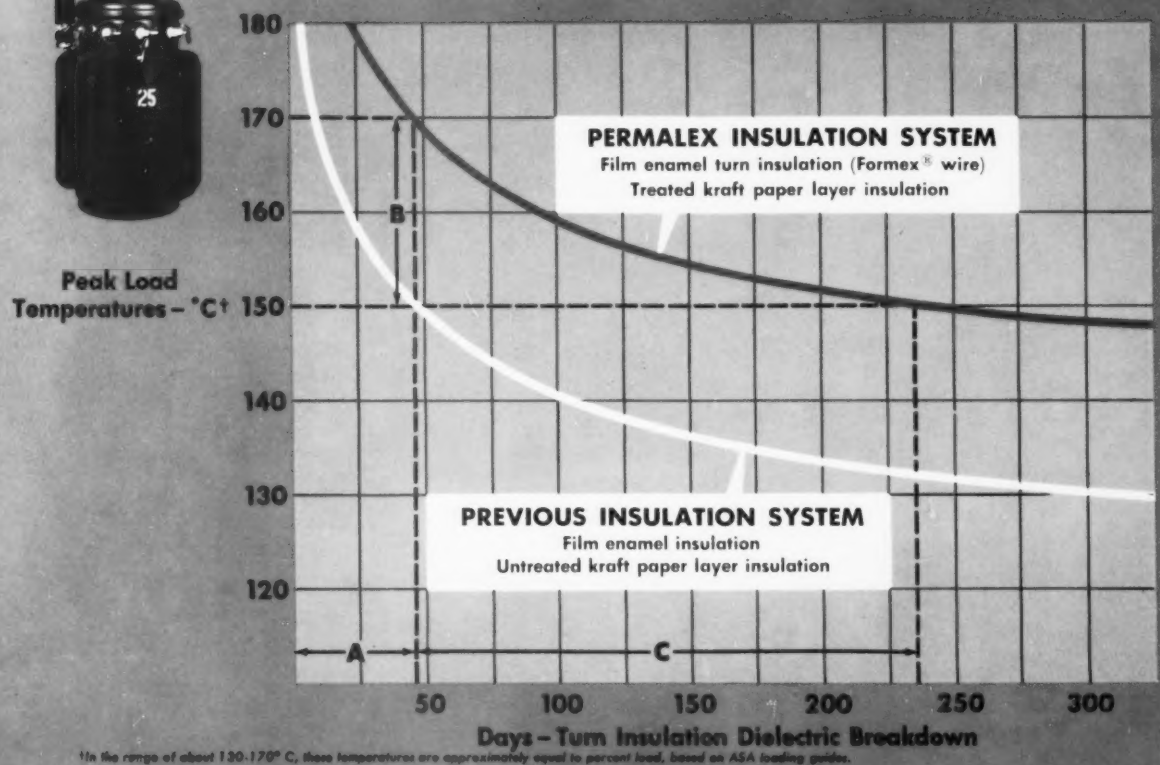
NEW Melalast* finish prevents service outages caused by birds and squirrels.



*Trademark of General Electric Company

GENERAL ELECTRIC

NEW 1959 GENERAL ELECTRIC DISTRIBUTION TRANSFORMER



†In the range of about 130-170° C, these temperatures are approximately equal to percent load, based on ASA loading guides.

NEW 1959 G-E DISTRIBUTION TRANSFORMERS, with Permalex insulation, provide utilities important savings in operating costs. For example, A shows life of former transformer at 150% of rated load. B shows how Permalex insulation increases loadability 20% with same life. C shows increased life—almost 400%—at present loads with new General Electric Permalex insulation system.

PERMALEX

Insulation Gives G-E Transformers Exclusive 20% Added Loadability with Full Transformer Life

Standard on the new 1959 General Electric pole-type distribution transformer, Permalex insulation brings electric utilities important savings in operating costs. You can get increased transformer loadability, or increased transformer life, or a combination of both. The new transformer will be available through 167 kva.

Users can increase transformer loading an additional 20% of nameplate rating and still get full transformer life – thanks to the increased loadability permitted by Permalex, the new General Electric insulation system.

Utilities who normally remove transformers, or add units, when peak load on the transformer reaches 150% of rating, for example, can now load to 170% and obtain the same long transformer life as before. Or you can utilize increased thermal stability to get 400% longer life with present load, or a combination of both increased life and load.

WHY PERMALEX GIVES EXTRA STRENGTH

The new Permalex insulation system uses a cyanoethylated kraft insulation material, patented by G.E., to preserve high dielectric strength. Cyanoethylation of the kraft retards formation of moisture, released by cellulosic materials when subjected to load.

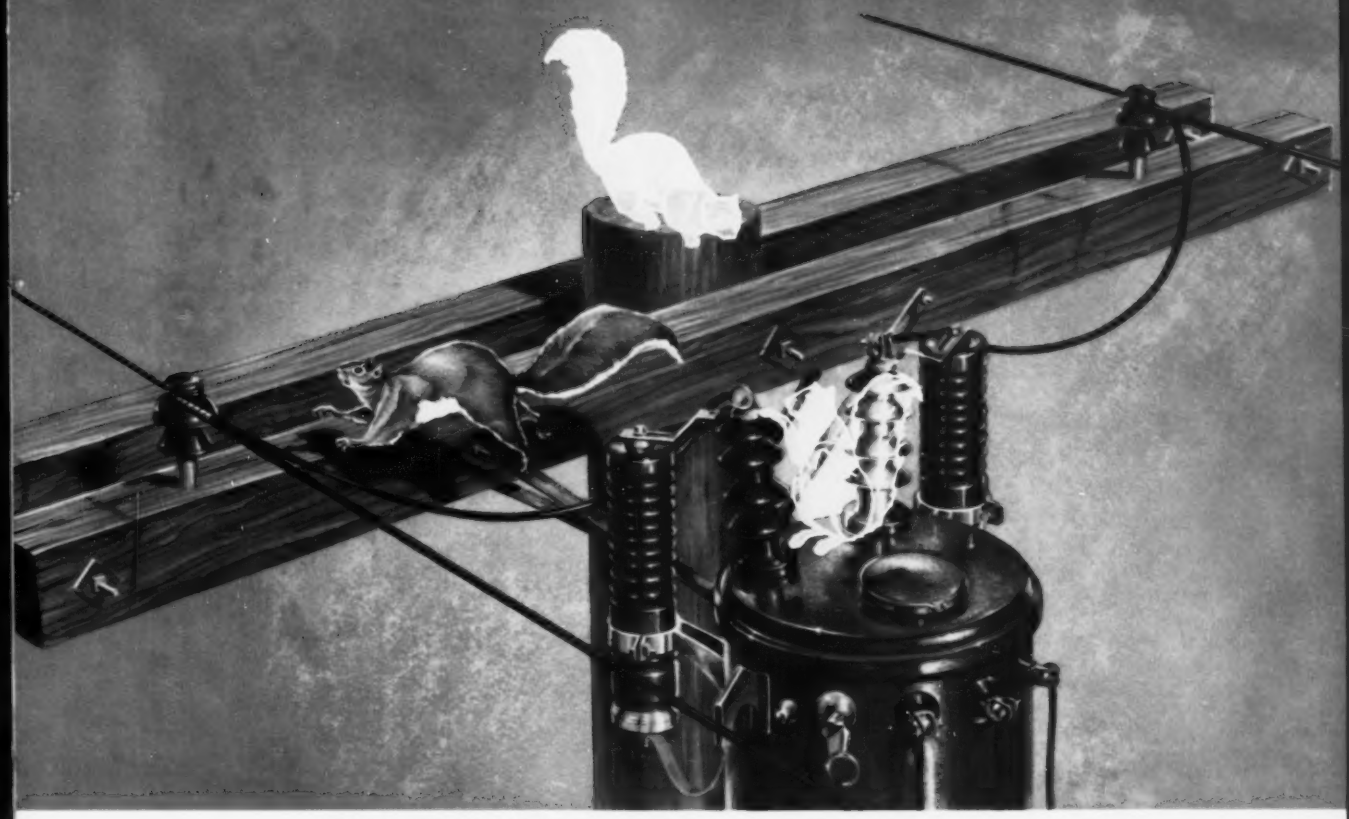
In the Permalex insulation system, cellulosic materials are treated in raw pulp stage to replace "OH" chemical groups with "Cyanoethyl" groups. Since this retards water formation, the new G-E transformer withstands better the higher temperatures which accelerate aging of insulations not treated by the cyanoethylation process.

PERMALEX IS COMPATIBLE

Permalex is completely compatible with everything in the transformer, is clean, safe and odorless. It has no detrimental effect on components such as enamel film insulation, steel or aluminum parts, or oil.

The new 1959 General Electric distribution transformers with exclusive Permalex insulation will be available at no price premium.

REDUCES UTILITY OPERATING AND MAINTENANCE COSTS



MELALAST FINISH ON COVERS of new G-E distribution transformers prevents outages caused by birds and squirrels, eliminates need for special "bird guards" or terminal taping. Slight shock sends visitors safely on their way, as shown in the artist's conception above.

MELALAST

Finish on Cover Prevents Outages Caused by Squirrels and Birds

New savings in installation and maintenance expenses are now possible with Melalast finish on covers of General Electric pole-type distribution transformers. This cost-saving feature is provided at no price premium on all ratings above 5 kv.

Melalast finish is a modified epoxy resin which insulates birds and squirrels from the grounded cover, thus preventing outages and customer complaints. It is applied to both main and handhole covers and cover bands.

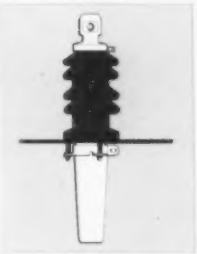
The Melalast coating protects from line to ground but still provides a slight shock, sending squirrels and birds safely on their way. Melalast finish also provides improved corrosion resistance.

Melalast finish, from the G-E Pittsfield laboratories, is another added value benefit which utilities derive from General Electric research and development.

GENERAL ELECTRIC

OTHER ADDED VALUE BENEFITS OF NEW G-E DISTRIBUTION TRANSFORMER

NEW BUSHING on the 1959 General Electric distribution transformer permits replacement of high-voltage fuse without removing the bushing. This helps reduce maintenance costs. In addition, positive method of internal clamping eliminates external parts, potential sources of corrosion.

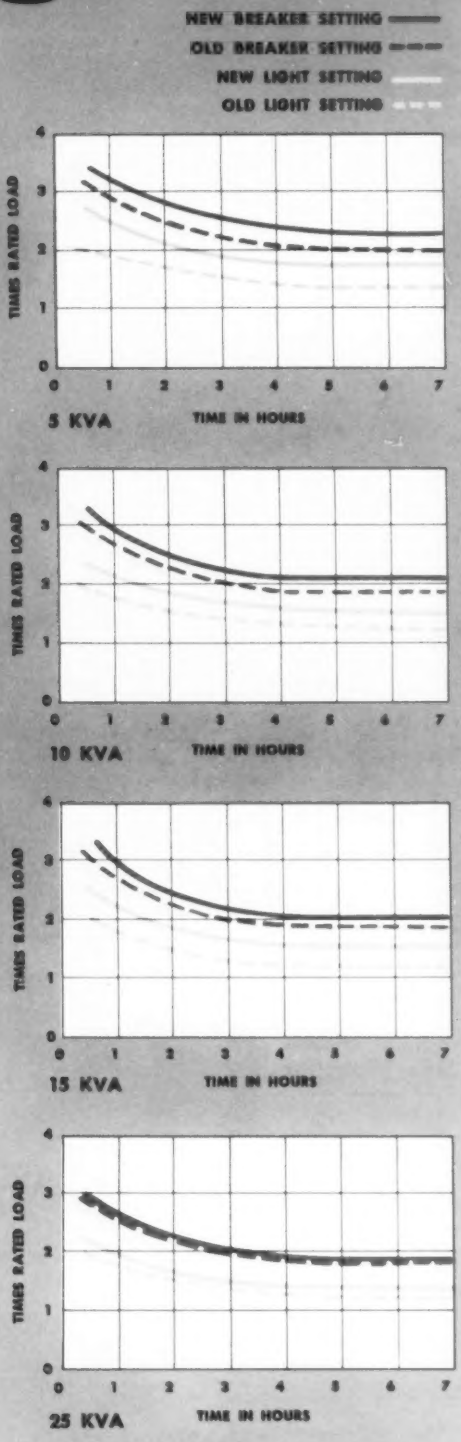


NEW ROLLED-UNDER BASE on G-E distribution transformers through 100 kva reduces maintenance costs by minimizing finish damage from scraping. Minimizes floor and truck-bed scuffing.

NEW LIGHT AND BREAKER SETTINGS make usable the extra loadability possible with Permalex insulation. Graphs and further details on following page.

→

NEW 1959 GENERAL ELECTRIC DISTRIBUTION TRANSFORMER REDUCES UTILITY OPERATING AND MAINTENANCE COSTS



LIGHT AND BREAKER SETTINGS are uprated on new G-E Type HSBA distribution transformers. The new settings make usable the increased loadability which Permalex insulation provides. Curves are based on 7200-volt ratings, 75 percent initial loading, 35 C ambient.

NEW Higher Light and Breaker Settings Make Extra Loadability Usable

The new 1959 General Electric distribution transformer establishes a logical, comfortable load-growth margin over the entire kva range for self-protected units. New light and breaker settings provide greater margins than the pre-1956 settings, thus avoiding "hot-weather" tripouts as air conditioning loads increase. Yet settings are not unrealistically far apart.

The new light and breaker settings reflect utility requirements to avoid both the too narrow margins prior to 1956 and too wide margins which make it difficult, if not impossible, to use the light as a warning for the coming changeout. Settings on the new General Electric Type HSBA distribution transformers make it simple to plan changeouts in advance, without any change in utility operating practices. And only on the new G-E transformer do you get these higher light settings and the resulting operating savings.

A new, red-bordered nameplate on transformers with Permalex insulation provides easy, positive identification of the increased loadability for both conventional and self-protected transformers. For users of HSBA transformers this nameplate will also identify the increased breaker settings. Important as it is, Permalex insulation is just one of . . .

10 REASONS WHY GENERAL ELECTRIC IS YOUR BEST TRANSFORMER BUY

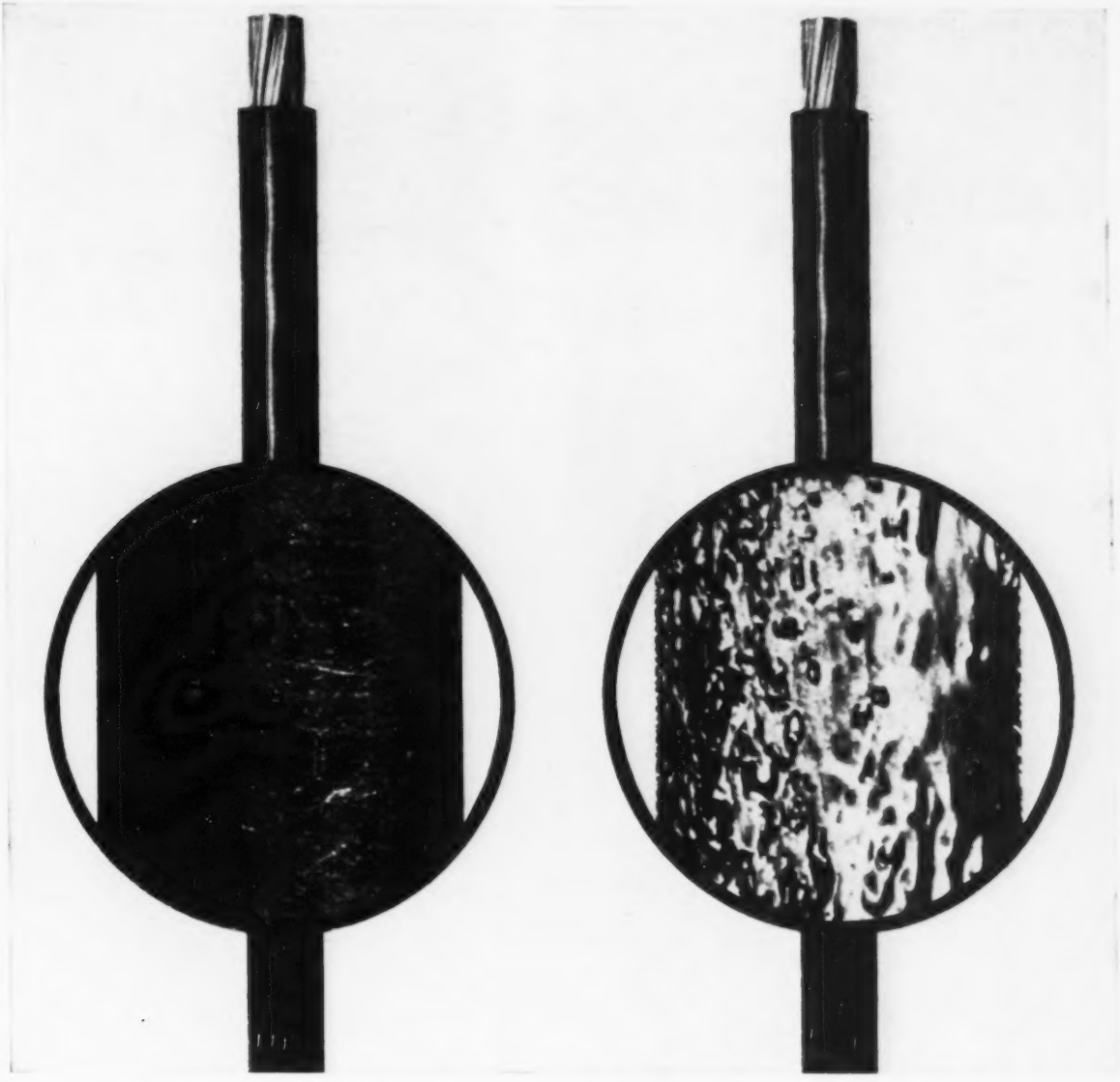
1. **New Permalex Insulation** increases transformer loadability by 20%.
2. **New Melalast Finish** on cover ends outages caused by animals.
3. **Formex Wire** helps cut size and weight, makes handling and changeouts easier.
4. **AL/CU Terminals** provide sure electrical contact with both aluminum and copper conductors.
5. **Strenicor Clamps** virtually eliminate secondary terminal failures and resulting service calls.
6. **Stainless Steel Bands, Nitrile Rubber Gaskets** simplify maintenance, resist corrosion.
7. **Impulse Testing** at factory assures extra years of reliable service.
8. **Self-Protected Transformers** are equipped with superior Thyrite* Magne-valve arresters.
9. **Computer-Controlled Ordering System** speeds delivery, helps reduce utility inventories.
10. **Careful Packaging**, guided by impact and vibration tests, cuts shipment damage.

Ask your G-E sales engineer for further details on the savings provided by new Permalex insulation and Melalast finish—and the 10 reasons why General Electric is your best transformer buy. Or write for bulletin GEA-6070 to G.E. Co., Section 431-85, Schenectady 5, N. Y.

*Reg. Trademark of G. E. Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC



QUALITY CONTROL MAKES THE DIFFERENCE IN ALCOA COVERED CONDUCTOR

Most covered conductor looks about the same . . . and, for the first few years, *may* perform about the same. But looks can often be deceiving and sometimes very costly. For the fact is: all covered conductor is not alike. There's very often a big difference . . . and, in Alcoa covered conductor, that big difference is quality control.

Consider the problem of moisture in polyethylene covers, shown in the enlarged illustration above. Though moisture is not absorbed by polyethylene, it will cling to polyethylene if proper manufacturing controls are not observed. Such moisture can actually be trapped in the polyethylene batch as it goes through the extruder . . . causing pin holes, voids, a spongy covering . . . creating weaknesses which contribute to reduced operating life. But in the manufacture of Alcoa covered conductor, this problem never has a chance to occur. Continuous quality control prevents these hidden weaknesses by eliminating their causes.

Alcoa covered conductor undergoes the most exhaustive series of tests in the industry . . . tests before, during and after manufacture to make sure you receive the very best product which can be made by the most modern production methods.

Recognize this big difference of quality control in your installations by specifying Alcoa . . . in neoprene, polyethylene or special coverings. No extra cost, but savings through added reliability and longer life are bound to be substantial. Aluminum Company of America, 2112-G Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and the Emmy Award winning "Alcoa Theatre" alternate Mondays, NBC-TV

ALCOA ALUMINUM

For phone number of closest representative see advertising index in back of book.

AS TULANE GROWS...

G&W PROVIDES ECONOMICAL

Campus scene—Tulane University

New main substation consists of two G&W Uniclad units. The large unit is the power center which houses a 15 kv, 400 ampere sectionalizing load break oil switch and eight three-phase power fuse taps. Facing it at left is the metering unit which houses a 15 kv, 400 ampere dual feeder load break oil switch and metering compartment.

Please send me your folder on the Tulane University installation.

Name_____

Position_____

Company_____

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City_____ Zone_____ State_____

FREE FOLDER tells how Tulane achieved flexibility and economy in its new electrical distribution system. Contains informative data for future reference.

SEND FOR IT TODAY!

Contributing to this project were G&W representative, W. P. Dillon; Director of Physical Plant Maintenance at Tulane, G. Johnson; consultants were W. King and R. C. Morgan IV of Design Engineers and Associates; I. Isaacson, Jr. of Weil and Moses; A. Pincus of Mario Zervigon and Associates and Joseph E. Leininger and Associates. The electrical contractors were Lindsey and Morgan, Gibson and Odom, Busy Electric, and Nola Electric.

G&W "RAL" sectionalizing switch installed in transformer vault. Loop feeders go to the switch to serve the load transformer. Feeders, switch, or load can be isolated without affecting the remainder of system. Shown are William King, design engineer (left), and George Johnson, Director of Physical Plant Maintenance, Tulane.

MEANS OF EXPANDING

an underground distribution system

When Tulane University's rapid growth created a need for expanding the existing 2400 volt electrical distribution system to a 13,800 volt loop system, G&W equipment scored a new high for flexibility, economy and dependability.

Versatile G&W equipment provides a simple, comparatively low-cost means of isolating load and circuit faults in any part of the system to avoid excessive outages.

G&W switches, fuse cutouts and Uniclads (metalclad switchgear) offer worthwhile savings. Made of standardized components, they are engineered to meet the exact requirements of the job. Assembly is simplified. Result: unexcelled distribution system economy!

G&W equipment offers many other significant advantages. Our new Tulane University folder gives the full story . . . be sure to send for it today.

George Johnson of Tulane (left) and Alan Pincus, consulting engineer, check a G&W Load Break Oil Switch-Fuse Unit under the Tulane stadium.

G&W ELECTRIC SPECIALTY CO.

3506 W. 127th St., Blue Island, Ill.

Canadian Mfr.-Powerlite Devices, Ltd.

Toronto, Montreal & Vancouver

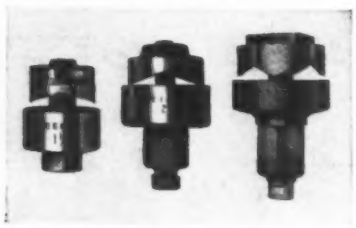
PULL CABLE FAST

through open or concealed conduit

Greenlee Cable Puller

Pull large-size cable at any angle, from any convenient location with a No. 765 Cable Puller. Use it for exposed or concealed conduit . . . high up, in close quarters, or out in the open. This powerful tool can be hand- or power-operated . . . exerts a maximum pull of 7,500 pounds and has two operating speeds . . . one for fast work, the other for a steadier, heavy pull. At all times the pull is in line with the conduit . . . no strain on the hangers. See your electrical distributor for this timesaving equipment, or write for literature.

Cut conduit holes quickly, easily with Greenlee Knockout Punches



Complete range of punches to make openings for all standard conduit sizes ½" - 5". Fast, easy cutting through 10-gauge metal. Hand, ratchet, or hydraulic driver operated. Wide choice of sets.

GREENLEE TOOL CO.
1765 Columbia Ave.
Rockford, Illinois

GREENLEE

ELECTRA'S HUSBAND

Semantics

ELECTRA was getting more and more fidgety as she listened to a group of us talk shop. Finally she could contain herself no longer: "I think you businessmen have got yourself all tangled up in your own jargon."

"Why do you say that, Electra?" asked one of the group. "We all understand each other pretty well."

"That's just it," explained Electra. "You think you know what you mean but what you say may have an entirely different meaning to your listeners."

"Electra may have a point there," interjected another of our friends. "There's a lot of people in this world who devote their lives to the subject of semantics."

"What's semantics?" asked Electra, reaching for the dictionary.

"Don't bother, Electra, all you'll find in Webster's is the statement that semantics is the science of meaning and the significance of words."

"Well, that's just what I'm talking about," said Electra. "You people use words that you think mean one thing, but they might mean something entirely different to some other person."

"Let's see if Electra's right," suggested someone else. "We can invent a new parlor game. Each one of you take a piece of paper and write the definition of a word I will give you."

There was a general shuffling around while each one of us got paper and pencil ready and our friend said, "All right, write your definition of the word 'liberal.' Now fold your papers and we'll shuffle them up and read each man's idea."

The definitions ranged all the way from free thinkers to communists.

"See," crowed Electra. "I told you so. I'm surprised that you make as intelligent conversations as you do with each of you having a different shade of meaning.

"Unfortunately," I sighed, "language is a very inexact science of communication and I suppose we do take too much for granted.

"Maybe that's the reason that we don't always get through to the other fellow. We probably use words he doesn't know and words that are subject to fairly wide interpretation within given limits. The problem is that if you select unusual words with fine shades of meaning your listeners think you're talking over their heads and if you use too simple phrases they think that you're underestimating their intelligence."

"Well, there's one thing certain," commented Electra. "Until you businessmen can talk the same language as the rank and file you're not going to be able to get them thinking about your point of view."

"I daresay you're right, Electra. There are probably still a lot of people who think of that old-time, silk-hatted, bloated caricature when anybody says capitalists. Profits seem to be synonymous with Wall Street to other people."

"You're absolutely right," interrupted another of the group. "You should have seen the blank stares I got the other day in talking to a group of Rotarians when I said that the utilities were a 'regulated monopoly.'"

"You are all doing fine," jibed Electra. "What do you think most people envision when you use words like 'equity financing,' 'step rates' and 'incremental demand'? Then think of all the words that you use that have double meanings like regulation. I'm beginning to believe that these people who study semantics may have something."

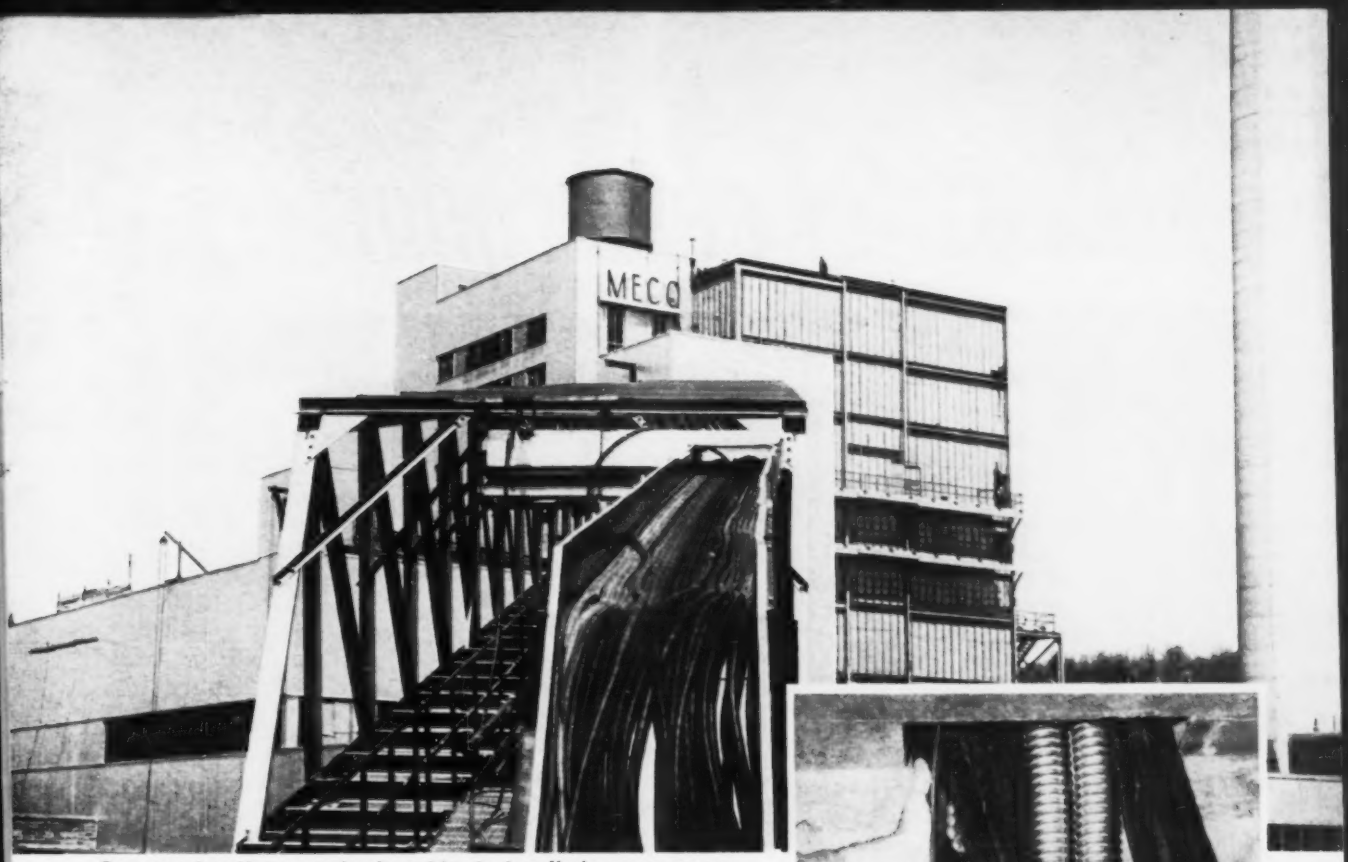
"I'm beginning to think so too," another of the group turned to me. "And you can do something about it."

"Why me?"

"Because you have a vehicle of communication and it seems to me that the time is right for some elementary A-B-C discussions of the meanings of common words." He sat back dreamily looking at the ceiling. "I can visualize a simple discussion on the meaning of profits, on taxation and a dozen other concepts that we take for granted but which are misunderstood, misinterpreted and misused by those who seek personal advantage."

"O.k., o.k., I'll run the series but somebody has to write it."

"I nominate Electra," said the first spokesman and notwithstanding the howls of anguish from my spouse, the ayes had it.



One construction, one basic cable design finds many uses. Open coal conveyor structure shown under construction above carries Okolite-Okoprene power and control cables from Metropolitan Edison Company's new Portland Generating Station to coal storage yard. Three types of the same cable meet in the tunnel (right) beneath the switching station: Okolite-Okoprene with CM-OT finish; Okolite-Okoprene with aluminum Loxarmor; Okolite-Okoprene with straight Okoprene sheath.

Another leading utility picks
Okolite-Okoprene for maximum margin of safety

Utmost reliability, proved by long-term service records, is the reason why Okolite-Okoprene was selected for the brand new Portland, Pa., Generating Station of the Metropolitan Edison Company—engineered by Gilbert Associates, Inc. Various Okolite-Okoprene cables have been installed for 600-volt power and control service with protective coverings designed for specific installation conditions. For example:

- **To avoid expense of conduit...permit quick addition of new circuits**...Okolite-Okoprene power cable with flexible aluminum Loxarmor, in trays, carries power to motors, pumps, coal conveyors, fans and practically all other operating equipment.

- **For maximum protection against soil corrosion, mechanical damage and insect attack**...Okolite-Okoprene control cable with Type CM-OT (corrugated bronze tape) finish is used for direct burial underground circuits to the switching station in the yard. Finish combines remarkable compressive strength with light weight and easy handling.

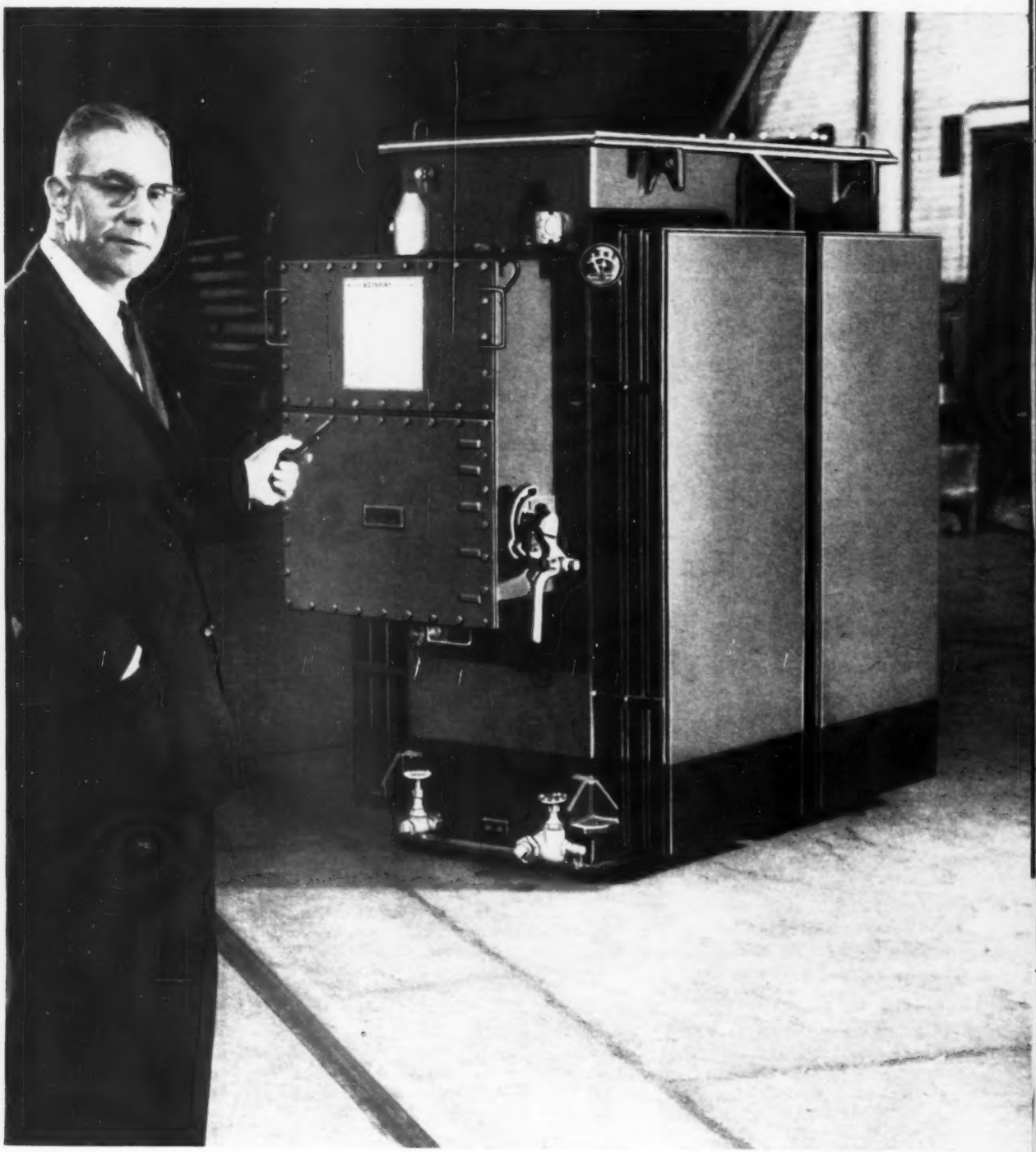
- **For great weathering strength and resistance to abrasion**... Okolite-Okoprene control cable with an overall Okoprene sheath is used for most other control circuits within station ...and installed in outdoor trays leading to coal storage yard.

Power stations from coast to coast rely on Okolite-Okoprene for vital power and control circuits—a testimonial to its dependability... its long life and dielectric strength... its resistance to corona cutting, moisture, heat, chemicals and mechanical damage. For further information on this premium quality cable, made by Okonite's exclusive strip-insulating process... and its adaptability to your important circuits, write for Bulletin WE-1085, The Okonite Company, Passaic, New Jersey.

where there's electrical power... there's **OKONITE CABLE**

6358

Built for close quarters...



Wagner Network Transformers

are small in size...have compact switch...feature panel radiators for smoother contour

Wagner network transformers are designed to give you smaller, lighter units, with smoother contours for easier maintenance. You can cut network system costs by using smaller vaults with these space-saving transformers—or you can put larger ratings in your present vaults. You save on maintenance, too. The panel type radiators are easy to clean, and an anti-corrosive tank finish protects exterior surfaces for years, under the adverse conditions of underground installation.

NEW WAGNER-DEVELOPED ROTARY SWITCH ... The rotary type, liquid filled high voltage switch was designed especially to meet the requirements of network systems—it is smaller in depth than previously used knife-blade type switches.

LOWER NOISE LEVEL ... Improvements in core design and materials, and newly developed methods of treating the core steel have made lower noise levels a feature of all Wagner transformers.

Constant research and development have kept Wagner up front in transformer design for more than 65 years—made the name Wagner one of the foremost in power planning.

For expert advice in solving your network transformer problems, consult your nearby Wagner Sales Engineer. There are Wagner Branches in 32 principal cities.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

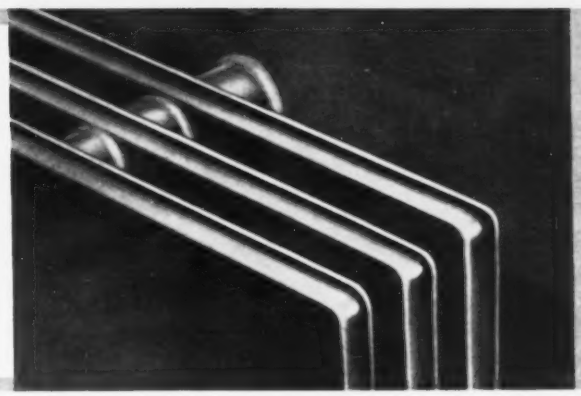
Wagner Electric Corporation

6381 PLYMOUTH AVENUE, ST. LOUIS 14, MISSOURI

WT59-7

NEW PANEL-TYPE RADIATORS

New design radiators have smooth vertical surfaces with far fewer places where corrosive moisture and dirt can accumulate. They're easy to keep clean. Reliability is improved because there are fewer places for leaks to develop.



SERVING 2 GREAT GROWTH INDUSTRIES... *ELECTRICAL... AUTOMOTIVE*

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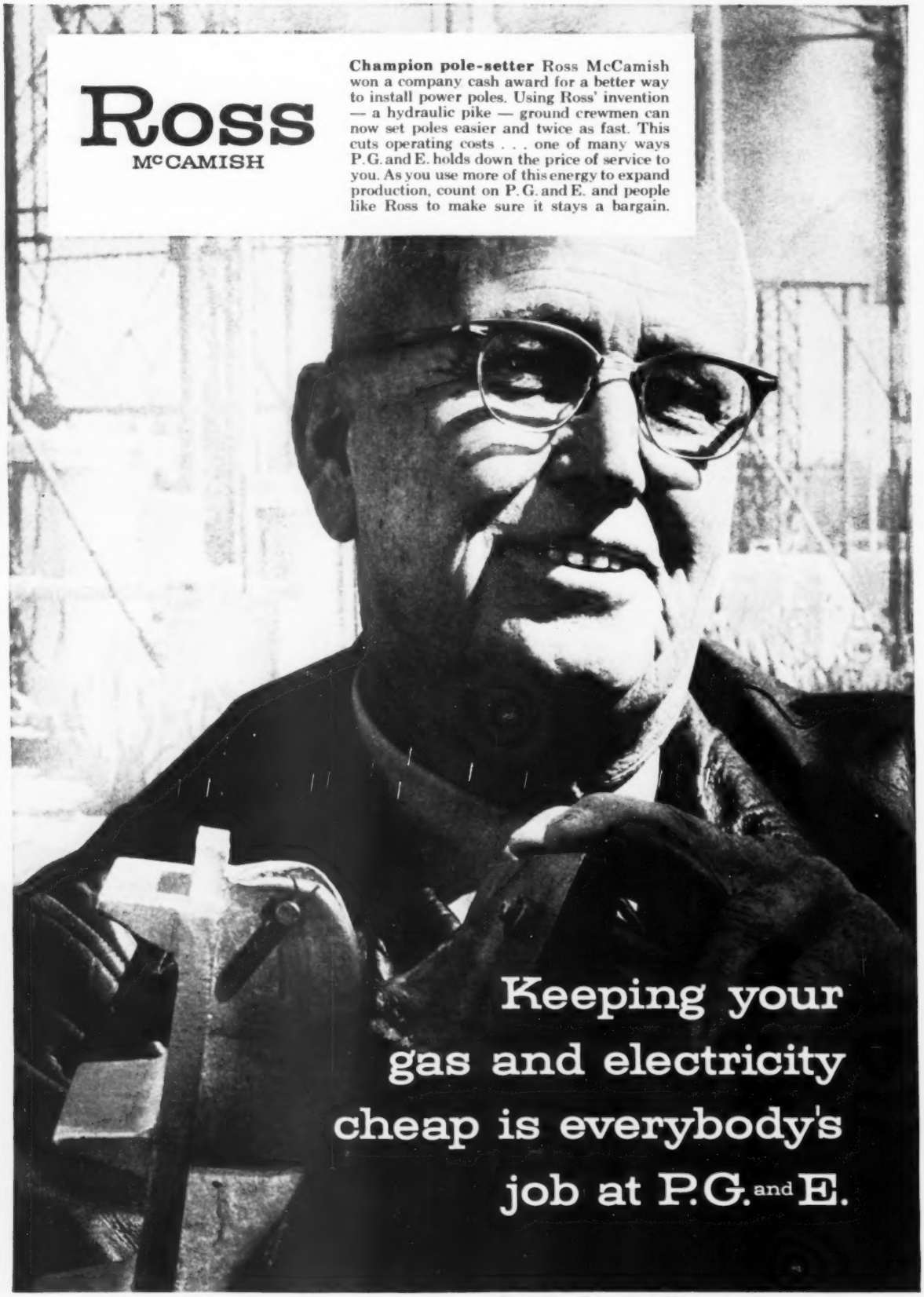

Ross
McCAMISH
Champion pole-setter Ross McCamish won a company cash award for a better way to install power poles. Using Ross' invention — a hydraulic pike — ground crewmen can now set poles easier and twice as fast. This cuts operating costs . . . one of many ways P.G. and E. holds down the price of service to you. As you use more of this energy to expand production, count on P.G. and E. and people like Ross to make sure it stays a bargain.
Keeping your gas and electricity cheap is everybody's job at P.G. and E.

Pacific Gas and Electric Company

ELECTRICAL WEST VOL. 123, NO. 1 JULY 1959

Protecting a power line on top of the world, a Western utility reports on . . .

The Cougnard—An Enigma That Works

E. G. White, Division Manager, Southern Colorado Power Co.

Each lightning season the Southern Colorado Power Co. line from Canon City to Westcliffe suffers numerous outages as well as the loss of three to six poles.

In the summer of 1957, a single strike completely removed five poles. Several days later the conductors were found a few feet from ground, crossarms hanging on the wire, poles entirely gone. Pole replacement costs in this rugged terrain are as high as $200. What to do?

Trouble Spot

Focal point for lightning damage is the eight-mile section "over the hump" at elevations averaging 9,000 ft. The 25-kv circuit carries no neutral and soil conditions make it extremely difficult and costly to obtain a good ground, hence conventional lightning protection is of questionable value.

A study of the available literature on the performance of Cougnard deionisers in the United States presented the intriguing possibility that satisfactory results might be obtained at a minimum installed cost. To this end the critical eight-mile section was protected in accordance with manufacturer's recommenda-

Performance during 1958 Lightning Season

Date	No. Strokes Near Line	Recloser Operations	Line Damage
June 5	6	none	Pole No. 553 slight splinter
July 6	8	1	none
July 12	12	none	Burn noted on deionizer
July 26	6	none	none
July 28	3	none	none
Aug. 9	6	none	none
Aug. 10	12	none	none
Aug. 12	4	none	Pole No. 528 slight splinter
Aug. 13	25	1	Pole No. 538 slight splinter signs of flashover on Cougnard
Aug. 14	10	none	none
Aug. 16	8	none	none
Total		2	3 poles slightly splintered, none requiring replacement

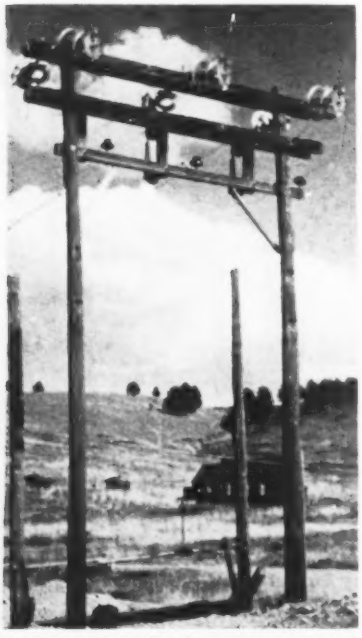
tion. It is perhaps of value to mention that the Cougnard devices were installed with hot sticks. Also, experience tends to indicate that the spacing of the element is somewhat critical. The total installed cost is tabulated separately. The performance of the Cougnard deioniser during each major storm of the 1958 lightning season is tabulated. The results indicate two recloser operations and three poles *slightly* splintered, but *not* requiring replacement.

Installed Cost

9-25 kv dead-end units @ $65	$ 585
24-25 kv pin-type units @ $60	1,440
Grounds and miscellaneous hardware	109
Labor and transportation	1,188
Total	**$3,322**

It should be pointed out that the lightning incidence in the area was equal to or greater than that which had been experienced in previous years. The two recloser operations compare with a previous average of eight per season for the entire 35-mile line.

While one year's experience is not considered conclusive there is a very strong indication that the Cougnard performance justifies its cost.



Dead-end installation, above, utilizing deioniser dead-end, lower right

The Cougnard—What is it?

The Cougnard deioniser is a lightning protective device. It was developed by Jerome Cougnard 24 years ago, and has been applied broadly in Europe and Africa with considerable success. Cougnard's theory as to why his devices work is built on a vortical or ball lightning theory. American engineers throw up their hand at Cougnard's explanations.

Notwithstanding, trial installations by the REA and Philadelphia Electric showed lightning performance considerably improved with the use of Cougnards. In a paper to EEI's T&D committee, H. N. Ekvall presented the following conclusions from his company's experience with the Cougnard.

"1. Comparisons of operating experience during lightning storms before and after installation of deionisers indicated the following:

(a) A moderate reduction in the average number of 33-kv line trippings. Also a reduction in the average number of locations with wire burndowns, line insulator damage and poles splintered when corrected for relative lightning severity;

(b) A large reduction in the average rate of 4-kv fuse blowings directly under the 33-kv line;

(c) A major reduction in teletype interference at the Willow Grove Naval Air Station.

2. Dead-end-type deionisers have shown several interesting characteristics as follows:

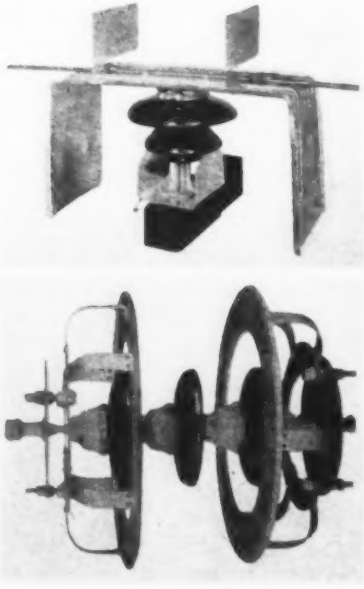
(a) They seem to have performed more frequently as discharge gaps to lightning surges than as barriers to ball lightning;

(b) Performing as gaps they have discharged mostly *without* accompanying line trippings indicating possible arc interrupting ability;

(c) Their widespread discharge activity is mainly due to their low impulse sparkover strength of only 200 kv as compared to 700 kv for the line in general."

The heart of the problem is that in the laboratory the Cougnard acts *simply like a gap* whereas on the line it *does not act like a gap.*

Beyond the fact that the Cougnard is a different device in the laboratory and on the line there are many "here is how I see it" explanations as there are people envolved. Until the industry makes a full-scale effort to document and interpret the performance of the wily Cougnard, it will remain—"an enigma that works."



Pin-type deionisers, upper left, were installed with hot line equipment

At Edison . . .

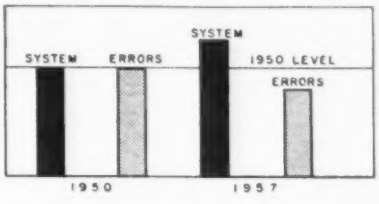
Training Reduces Errors 19%

J. G. Winkelpleck
Substation Operators Training School
Southern California Edison Co.

On Jan. 30, 1959, the substation division of the Southern California Edison Co. graduated class 100 from its Substation Operators Training School in Alhambra. A special luncheon and graduation were held in honor of the occasion.

After World War II it was recognized that there would be much rebuilding and expansion of substation, distribution and transmission facilities to keep abreast of the growing demands in southern California. In addition to new equipment to be installed, supervisory control would be added to many stations throughout the system. Newer types of protective relays were being installed on transmission and distribution lines. This presented the problem of an increased number of switching operations. Upgrading the operator's ability to cope with new situations and equipment pointed to a single solution—*training*.

Because of the particular nature of the substation operators duties, the training would have to be specialized. There were no outside schools an operator could attend that offered the type of special training required. In September 1948 plans were formulated for a substation operators school. During March 1950, three groups of substation chiefs and chief operators



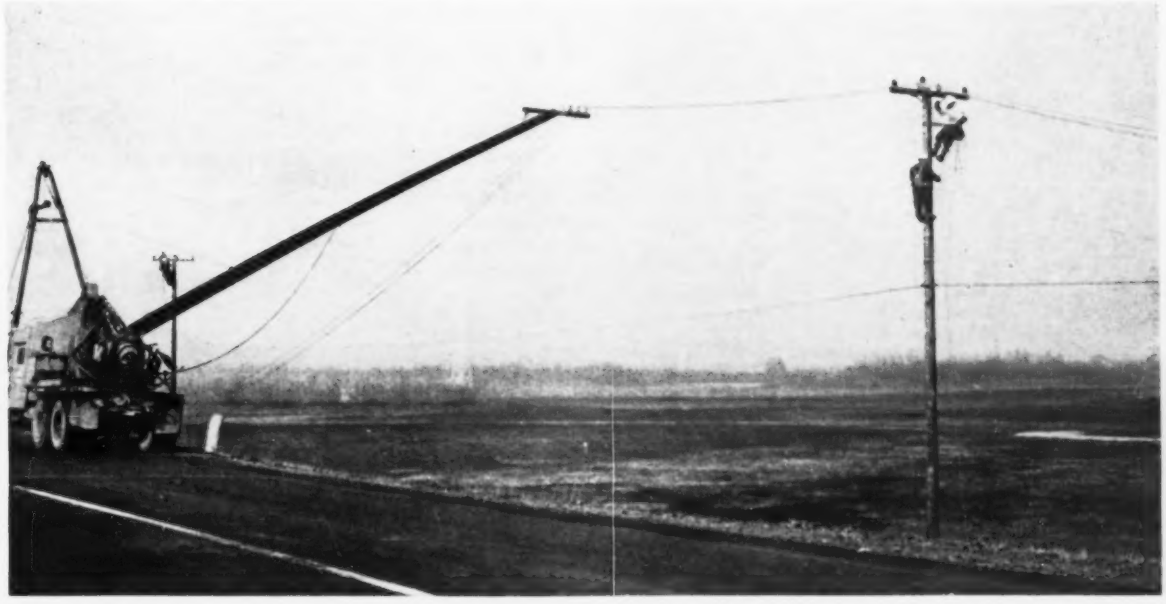
attended school to discuss the training curriculum. It was agreed that this curriculum would be divided into four parts: (1) review and interpretation of dispatcher's bulletins, accident prevention rule book, and substation division orders; (2) theory; (3) routine switching; (4) emergency switching.

On March 27, 1950, the first class of six operators started school. This number has since increased to seven men per class. To date 620 men have attended the school. Each year additional training aids and improvements have been added. The class continues for one month and, upon successful completion, each trainee is issued a certificate. Many have since progressed into supervisory positions or better operating classifications. Seventy-four men have attended school twice, first as a non-switching center operator, then as a switching center operator.

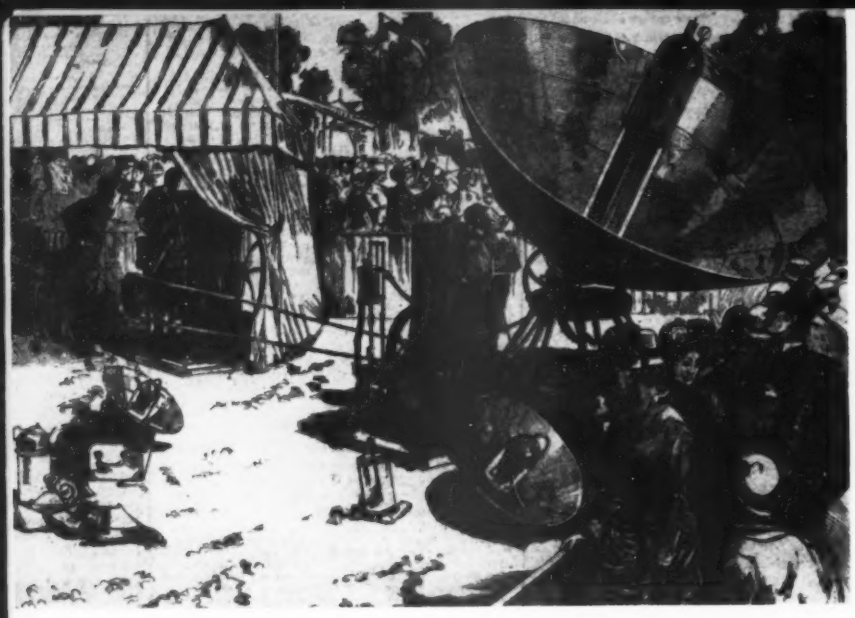
The effectiveness of this specialized training can be noted by way of comparison. Between 1950, when classes first started, and 1957, transmission and distribution circuit miles increased approximately 24% and attended and unattended substations increased approximately 10%. It may be expected that operating errors would increase. However, the number of errors for the year 1957 compared to 1950 showed a 19% decrease. There were fewer switching errors in the face of a considerable increase in switching volume.

It is felt that the training program aroused the interest of the operators and allowed the increased switching traffic to be handled safely and efficiently.

The training program has been received with enthusiasm by the operators. Men who have been through the school look forward to the time they will return to class in the more advanced group.



Clark County PUD crews recently strung 6,600 ft of pole line in half a day, using a 40-ft utility pole mounted like a boom to carry the four conductors from pole to pole. Conventional methods would have taken two days. Elevation of the road suggested this time-saving approach, which illustrates the many ingenious ways utilities must employ to minimize costs



Solar energy used to drive a printing press in Paris, 1882. Solar furnace and engine right, press under pavilion

A national authority gives us a progress report on . . .

Power From the Sun

John Yellott, President, John Yellott Associates, Phoenix, Ariz.

One of the greatest technological challenges of our time is learning to use our abundant solar resources.

To meet this challenge requires understanding of two fundamental limitations of solar-powered equipment here on earth. The first limitation is the relatively low intensity of the radiation that reaches the earth. Even the perfect converter would require 12 sq ft of noon day sun per kilowatt of capacity, with today's best converter requiring 10 times this area. *Even with today's efficiencies, the roof of the average home receives 10 times the daily energy requirements of the family within.* The second and most aggravating limitation is the intermittent nature of the radiation whereby the earth's rotation, clouds and fog curtail or stop the energy. Firm power from the sun awaits the discovery of a new form of energy storage.

In spite of these handicaps there are many who feel that solar energy can, and indeed must, supply a portion of tomorrow's energy requirements. Fundamental developments during the past five years have done more to make this a reality than all of the efforts through the rest of recorded history.

Thermal Cycles

Flat plate collectors utilizing a black surface to convert solar radiation into heat can reach operating temperatures of about 350 F. With the proper fluid such a collector can power small engines or turbines. A pump operating on this principle is manufactured in Italy and a number of them are in irrigation service in North Africa. The plants are bulky, expensive and inefficient and are only advantageous where low-cost fuels are virtually nonexistent.

Temperature and pressures comparable to those in modern steam plants can be obtained through the use of devices such as parabolic reflectors. Here again the capacity of the unit is limited by the cross section of the collector, and by the fact that the collector must "follow the sun."

Thus thermal solar cycles quickly lose out wherever low-cost energy of any kind is available.

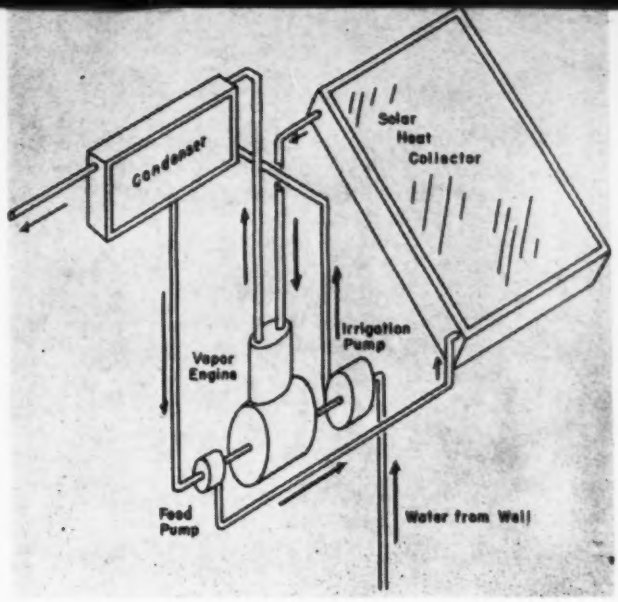
Thermo Electricity

The generation of electricity by means of junctions of dissimilar metals kept at different temperatures has been employed for many years in measuring and control instruments. These metallic thermocouples normally have a conversion efficiency below 1%. Recently, advances in the field of semiconductors have made available for the first time materials that combine low electrical resistance with low thermal conductivity. The new lead telluride alloys have efficiencies as high as 10%, and both Russian and U. S. scientists confidently expect to increase this efficiency to 20% or higher within the next 10 years. With no moving parts, and no required maintenance, the thermal elements can operate at temperatures so high that the thermal efficiency goes up to 70%. This is combined with a potential electrical efficiency of 40% to 45%. The over-all efficiency then approaches 30%—not bad for a small power generator.

These new thermocouples are the heart of the nuclear powered Snap III power source for satellites. The heat source is nuclear—but it could be solar!

Another device for directly producing electricity from heat is an

Dr. Yellott, left, plays a solar-powered radio before a Greek Rotary Club. The silicon solar battery was charged by Phoenix sunshine—played the radio in Greece



Schematic of solar thermal cycle that powers irrigation pumps in power-poor countries. Equipment is inefficient (5% - 10%) and costly, useless at night

adaptation of Edison's first two-element vacuum tube. General Electric scientists have adapted the 75-year-old Edison effect to a new thermionic device in which electrons from a high-temperature source flow to a relatively cold anode through a space containing a small amount of caesium ions. Maximum efficiency of this device today is about 13.5%, but the theoretical upper limit is an encouraging 30%.

Latest in the list of new heat-to-electricity converters is a plasma thermocouple in which ionized caesium gas serves as one of the conductors. Enriched uranium, heated by neutron bombardment, is the source of the electrons in this device, which is the first to bring electricity from the atom without the intervention of a thermal cycle. In this device a solar furnace could serve as the heat source instead of the neutron-plus-U235 combination just as solar radiation could replace polonium isotope as the heat source in Snap III.

Hoffman Electronics

Big Bertha, a battery of 400 silicon cells produce enough power for communications

Photo Electricity

Prior to World War II, the generation of electricity by the direct action of light was a phenomenon of interest only to users of photographic light meters. The discovery of the transistor and the properties of semiconductors ultimately lead to the silicon solar battery (really a converter) fully 10 times better than any previous photoelectric device. These new cells produce .6 v and can produce power up to 20 milliwatts. Arranged in series-parallel combinations, they powered an experimental telephone in 1955. Quantity production has greatly reduced the price of these cells so that today portable radios with rechargeable dry cells are on the market. In this earth-bound application, at least, the technology of the last few years has enabled solar power to compete effectively with the chemical battery and the plug cord.

Space Applications

In space, solar energy comes into its own. Without the earth to hide the sun from dusk to dawn, solar radiation becomes a continuous energy source. Many scientists feel that in weightless space with no atmosphere to contend with, a great sail dotted with photoelectric cells can be spread to supply power. Vanguard I, which went into orbit March 17, 1958, carried a cluster of solar batteries on the outer surface of its small sphere. Operating over a wide temperature range, and requiring no concentration of the sun's rays, these devices have remained undamaged by any kind of radiation and continue to operate long after the chemical batteries in other satellites have gone dead.

For earth-bound applications where sun and power must compete with conventional power sources, two major breakthroughs are needed: first, a cost breakthrough as effective as the original technological discovery which will lead us to the large area simply constructed solar converter; second, a low cost storage device for storing day time energy for use at night.

A Competitor First

In today's economic framework, solar energy in electrical form is far from competitive with central station power. Here is how they compare:

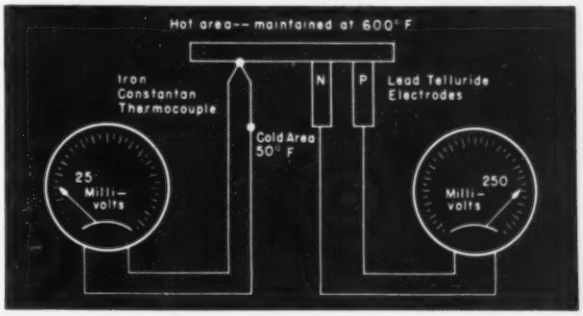
Solar electrical energy (approximately) 50¢ kwh
Central station power 2¢/kwh

In the form of low-temperature heat, however, the freedom from the penalty imposed by low heat-to-electrical conversion efficiency vanishes and the comparison is:

Gas heat .....$ .60/million Btu
Solar heat ..... 1.50/million Btu
(15% annual charges)
Electric heat .... 6.00/million Btu

With this relationship it can be seen that solar energy may manifest itself as a competitor, similar to gas, long before it becomes an electrical ally. A view of solar heat on a 20-30-year writeoff period, as is the case with the remainder of the home investment, would make this energy source attractive today—at least in the southern half of our country.

While we are learning to use it, the sun will send us 675,000,000,000,000 kwh per day—for free.



Meters show how new lead—Telluride thermocouples increase voltage 10 times over iron constantan

W. Harold Jones (standing), underground engineer, and the author study results as they come from the computer total

Digital computer speeds . . .

Network Load Study

H. D. Felber, Electrical Engineer

Sacramento Municipal Utility District

The downtown area of the Sacramento Municipal Utility District is served partially from a 4-kv primary fed, radial secondary and partially from two separate 12-kv fed secondary networks. SMUD is now in the process of converting from the 4 kv to the 12-kv primary and plans ultimately to serve the area from several separate secondary networks of 216Y/125 v. Large installations will be served by 480Y/277-v spot networks whenever the higher voltage becomes more economical.

As the load on each network increases, its six 12-kv primary feeders with their corresponding secondary ties will be extended to increase the capacity and complexity of the network. As a result, it has become impossible to predict with accuracy the line load flows that would occur on either the 12-kv circuits or the secondary network should it become necessary to operate under abnormal conditions such as primary or secondary feeder outages.

An LGP-30 Royal McBee digital computer, recently acquired by SMUD, provided a solution to the problem by performing a complete load flow analysis in a relatively short time. A network load flow analysis program for the LGP-30 was written by W. H. Osterle of West Penn Power Co. and Mel Kaye of the Roy McBee Corp., following a procedure developed by J. B. Ward and W. H. Hale. This program is capable of analyzing a network of up to 100 buses or network junctions and 270 lines.

SMUD's network under study consisted of 73 buses and 139 lines including the existing system and several proposed additions. As the program is designed to accept data on a per unit basis it is possible to consider the primary circuits and secondary network as a single system and yet derive information concerning both components of the system separately.

The load flow program was read into the memory in the computer in approximately 30 minutes. This prepared the computer to accept system data, perform the analysis, and print out the results as described below.

After assembly of the necessary data and selection of variables, the figures were read into the machine memory in the following order:

1. The impedance of each line.
2. Bus conditions specified by power and voltage both real and reactive.
3. A precision index (to determine the accuracy of the results).
4. An acceleration factor (to determine speed of performance of the calculations).

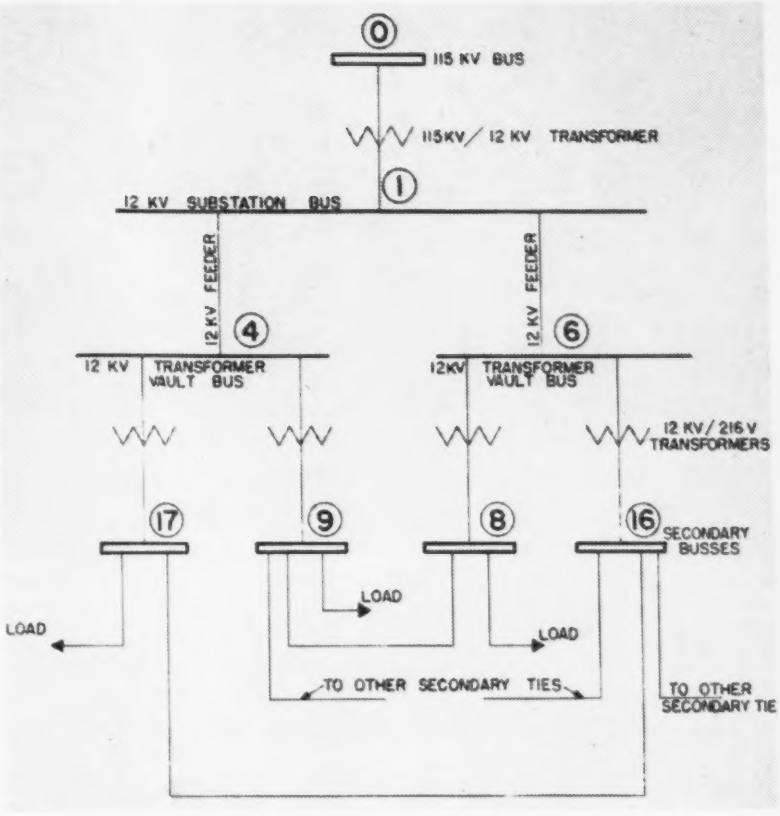
While not required for SMUD's underground system, there are provisions in the computer program for the following additional data:

1. Line impedance changes.
2. Off nominal transformer turn ratios.
3. Capacitor changes.
4. Fixed buses.
5. Released buses.

Upon the receipt of the last of the data the computer automatically begins to calculate and prints out the results in approximately 30 minutes.

The buses are printed out by number along with each associated power flow both real and reactive and voltage and phase angle. Second, the lines are printed out by number along with each associated power flow both real and reactive, completing the print out.

Print-out results shown refer to diagram right, which is only a section of the SMUD network system. Complete system included 73 buses and 139 lines



After the system had been analyzed as described above for normal operating conditions, each of the 12-kv feeders were hypothetically taken out of service by setting their admittances equal to zero and six additional analyses were performed.

As a partial verification of results, spot checks with actual field load readings were taken and found to agree with the computer results as closely as would be required for any planned study. A network analyzer would produce about the same results. For greater accuracy such as that required for a short circuit or relaying study the precision index would have to be readjusted.

About one month was required for the complete study from the collecting of the data to the print of the results.

It is necessary to acquire a certain degree of skill in the manipulation of the different variables and to cope with the bugs which appear in any computer study. The actual machine time was approximately two hours for each case studied.

The use of an a-c network analyzer was considered and determined impractical due to its lack of versatility. The network analyzer is limited to special purpose problems involving distribution systems, while the general purpose computer may be utilized in a broader problem area.

The over-all results were considered satisfactory and there is presently another load flow study underway on SMUD's 69-kv subtransmission systems.

How Computer Points Up System Needs

Generator	PU Voltage Limits*	Case I Normal Operation Voltage	Case IV 12-kv Feeder No. 4 Out of Service Voltage	Case VI 12-kv Feeder No. 6 Out of Service Voltage
00	1.12–1.25	1.138	**1.080**	1.138
04	1.09–1.11	1.091	**1.020**	**1.079**
06	1.09–1.11	1.093	**1.015**	**1.086**
08	1.04–1.08	1.070	**.992**	**1.014**
09	1.04–1.08	1.069	**.973**	1.052
16	1.04–1.08	1.066	**.979**	1.046
17	1.04–1.08	1.064	**.963**	1.049
Line	**PU Line Kva Limits***	**Line Kva**	**Line Kva**	**Line Kva**
00–01	2.5	1.381	1.34199	1.33060
01–04	0.5	.26522	0	.32297
01–06	0.5	.15588	.21546	0
04–09	.54	.02370	0	.03885
04–17	.54	.03240	0	.04455
06–08	.54	.02337	.03340	0
06–16	.54	.03041	.04569	0
08–09	.0165	.00052	.01044	— **.02268**
16–17	.0444	.00736	.04056	— .00446
		Evaluation Voltage and line flows all in limits as expected.	**Evaluation** This condition shows need for more transformers to shorten secondary—boost voltage.	**Evaluation** Voltage effect of feeder loss evident again—more transformers. Serious overload of line 08–09 indicates need for heavier conductor.

*The per unit and power on a 10-mva base. The per-unit voltage is on a 12-kv primary and a 200-v secondary.

Kitchen specialists go to school to learn how to please customers and increase profits

Bureau division becomes agency for customers and dealers in program to help kitchen specialists

Design for Profit

AN efficient kitchen can benefit just about everybody. At least that's the way San Diego Gas & Electric Co. and the Bureau of Home Appliances reasoned when they set up their kitchen program almost two years ago.

And time has borne out their contention that a well-planned kitchen can go a long way to clinch a house sale at any time and is an essential during a slow market. This helps the builder, of course, and along with him the architect, the manufacturer, the kitchen dealer and, last but not least, the utility customer who buys the house. Then there's the modernization market—a potential of some 250,000 to 300,000 homes in San Diego County.

Whether he is buying or remodeling, the right design is essential. As James M. Hardin, San Diego Gas & Electric representative, put it: "Whether the plan is right or wrong, the kitchen stays that way many years." To make it "right," the utility started its program to help the customer get a kitchen designed just for him. Organized in September 1957, the service is offered to customers, contractors, architects, designers and dealers. As described by Jim Hardin, the coordinator, here is how it works.

Two of the eight kitchens in the Parade, a feature of the bureau-sponsored Spring Fair of Modern Ideas. Above, St. Charles Kitchen Designer, La Jolla, put in this complete display. Below, Worth Pollard of California Electric Works helps a prospect decide

The Setup

The first step was to organize the area's kitchen dealers into a Kitchen Division of the San Diego Bureau of Home Appliances, giving the public a recognized agency for this type of work. People now know where to go for information on kitchen design.

Prospects developed by the utility through a varied and intensive promotional program are turned over to a kitchen dealer. Among promotional tools are:

An **information booklet given to all new customers** was revised to carry a few paragraphs on the importance of a well-planned kitchen.

Adult education programs, tailored to the audience, are offered to groups of architects, draftsmen, to home economics classes and women's clubs. Slides showing fundamentals of kitchen planning and the G-E film, *Happy is the Home*, are used in these group sessions.

Radio and TV help tell the story. The utility's once a month program, *Home on the Ranch*, the TV *Homemaker of the Week* and *Weatherword* carry messages on kitchen modernization.

Ads and features take the message to newspaper readers. A Kitchen of the Month feature in the *Union's* Sunday Building Section gives the plan and special features of a modernization job. A series in the *Tribune* carries kitchen hints. Reader questions are answered in the column.

Displays in windows and offices and the Parade of Kitchens have made thousands of people kitchen conscious.

Dealer Training

Of first importance is the dealer training program. About 50 have learned how to increase profits from kitchen sales in a bureau-sponsored course. Designed to fill the need for a short basic course in the fundamentals of selling and some of the technical aspects of kitchen modernization, these sessions are not intended to take the place of the many excellent and extensive kitchen schools conducted by cabinet manufacturers, Hardin emphasized.

Luncheon meetings held every other month bring the kitchen dealers together to hear guest speakers on varied aspects of kitchen design or modernization. A recent luncheon featured a New York artist and consultant, Jon Gnagy, on the use of color in kitchens.

Specialists Only

The program is tailored to kitchen specialists. As Bob Gray, St. Charles Kitchens and chairman of the division, advises: "Dealers shouldn't go into this business on a shoestring or without knowledge. If they do, they'll get hurt. And once in, they can't just assign someone in the organization to the job; they have to be specialists." Gray believes that a customer can afford to pay about the same amount for a kitchen as an auto. With this rule of thumb, he tries for the Cadillac, Lincoln and Buick class.

An artist himself, Gray likes his work. He believes that requirements for success are interest in the job; good business management, proper design and installation (women don't want their houses all torn up); a liking for people. In four years and some 60 jobs ranging up to $10,000, Gray has found that the formula works.

These men helped to get the program on its feet. From left: Worth Pollard, Calewo, vice-chairman of the Kitchen Division; Bob Gray, St. Charles Kitchen Designer, chairman; Oliver Schutte, modern kitchens, first chairman of the division; Bob Hardin, San Diego Gas & Electric Co., program coordinator

Everybody Helps

The cooperative policy that has helped make the San Diego Bureau one of the most successful in the United States has been a force in this program. One instance was the recent Parade of Kitchens, staged as a part of the bureau's Spring Fair of Modern Ideas.

The kitchens—eight of them—were complete in every detail and cost the individual dealers a lot of money. But despite the competitive nature of the exhibit, everybody pitched in where help was needed. A light fixture might be lacking here—somebody had an extra one and gladly lent it to make the entire parade a powerful sales stimulant. And that's what it turned out to be. Every kitchen but Grandma's (sponsored by the utility and Knott's Berry Farm and a major attraction) built up good prospect lists.

Thus a youngster among San Diego bureau divisions is proving again that knowledge, salesmanship and hard work can do a job.

Window displays like this one in San Diego Gas & Electric's main office building show modern cooking equipment; help build customer interest in new or remodeled kitchens

San Jose builder Dick Manfre credits the entire electrical industry for its contributions toward making . . .

Gold Medallion Homes Preferred

Valance lighting, eyeballs over fireplace, in-wall electric heat are some of the conveniences in the living room at the R. H. Manfre Medallion Homes in San Jose, Calif.

Most remarkable thing about the Gold Medallion Homes built in San Jose by R. H. Manfre, complete in every electrical detail, is that the entire electrical industry of the area was in on it. It was sponsored by the Electrical Construction Industry Advisory Committee of contractors and IBEW Local 332 for the outstanding National Electrical Week promotion. It was participated in by the manufacturers listed on the billboard outside the homes and by their distributors. During the open-house period four apprentices were guides to the public viewing the homes, explaining the electrical features. The committee for the week consisted of Jim Sardella, chairman, and Roy Durbin, contractor; Dick Scanlon, dealer; Bill Gibbs, KNTV; Joe Puglese, distributor; Ray Hollingsworth, Radio KEEN; Lew Russell, Ray Bouret and George Lynch, PG and E; and Robert Coleman, NECA; but everybody got in on it.

Bed lamps on dimmer control, valance along wall and across windows, electric heat on thermostat, intercom system, plenty of outlets characterize the master bedroom

Master bath heated by ceiling lamp and heater. Note soffit light over wash basin

Kitchen has plug-in plastic strip around all counters; appliance control, built-in range, vent hood and light, enclosed fluorescent strip over pass-through counter

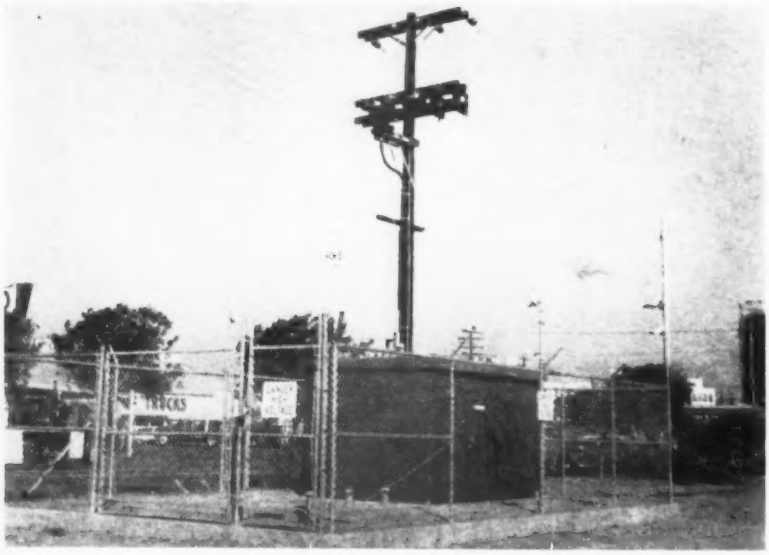
Breakfast room has valance lighting and intercom master panel for entire home

Below—Outlets provided in conduit for garden lighting in yard and front too

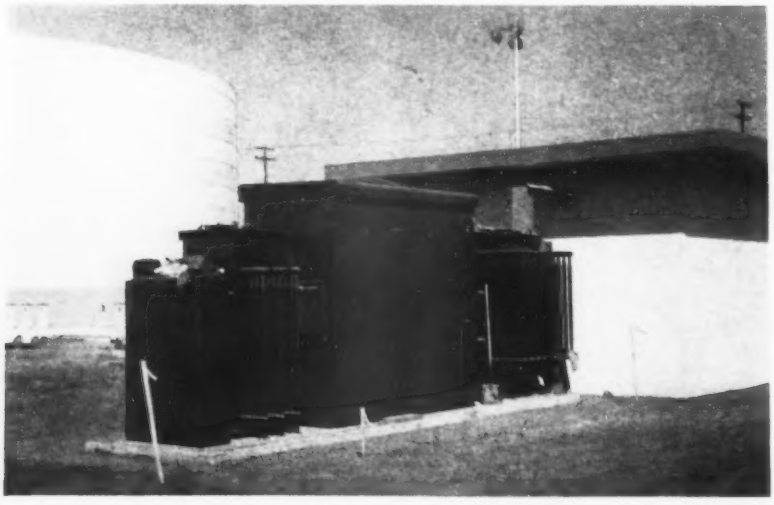
Service entrance with three panelboards

Ship Terminal Plans for Growth

Engineers Liebmann and Lipscomb planning



Main service substation where power is received and distributed at 12 kv



One of the unit substations, to take care of the east end of the total area

Electric service will cause no interruption of work at the new 10th Avenue Port of San Diego terminal, whether longshoremen or other dock workers do or not. A long-term-planned, simulated loop system of electric supply distribution assures this electrical continuity. Furthermore, the system provides facility of expansion and capacity for growth of the port, even now the third largest on the Pacific Coast.

The new terminal has been planned over some years by San Diego's harbor engineer, Joachim E. Liebmann, and its electrical design by Willis L. Lipscomb, electrical consulting engineer. It is laid out to take care of the electrical needs of two transit sheds, each 200,000 sq ft; a 48,000-sq-ft warehouse, two future 350,000-sq-ft warehouses, two future gantry cranes, bunkering facility storage tanks with loading and unloading motor control located at each of the nine bunkering stations along the quay wall. In addition cathodic protection is given for the steel in the quay wall. Main switchgear metering facilities are designed so as to expand as required for another terminal of the same size to be located adjacent to this one. The two present gantry cranes have an 800-hp motor for which capacity is provided.

Distribution System

A completely flexible and dependable power distribution system is provided by two 12-kv, three-phase, three-wire feeders with a capacity of 4,200 kva at 75% load factor. The two feeders extend from the main switchboard in such manner that the two simulate a loop system. Each feeder, however, normally operates

independently of the other but by properly operating the various oil switches, located in manholes and vaults, either one of the two feeders will provide power for the entire site.

Thus the system of feeders and high-voltage oil switches provide a means whereby any given section of the two feeders can be completely isolated if a fault occurs.

Each of the two 12-kv feeders is controlled by a 250-mva, 1,200-amp, 13.8-kv air circuit breaker provided with relay overcurrent protection. A long term outage will be almost impossible in view of the complete flexibility of the distribution and switching system.

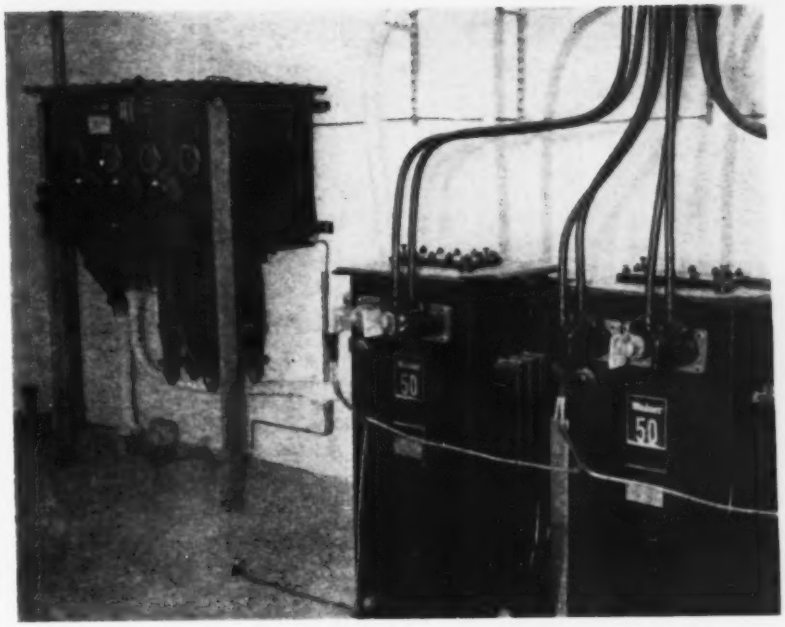
A total of 26 G&W sectionalizing load break submersible oil switches, each rated at 400 amp at 15 kv, are used. Each has multiple switch contacts which can isolate or connect a given transformer to one or the other of the two main feeders. Two types are used, a three way and a four way. The three-way serves the function of three different switches—a loop through, an isolating switch and a double throw switch. The four-way permits various combinations of feeders and loads by tying to the switch bus through individual load break disconnects. Stud bushing compartments make the system expandable without interrupting power.

The Wagner transformers installed are of the subway type in which a "weak link" protection device in the primary and a current limiting circuit breaker in the secondary insures complete protection for both the primary cables and the transformer windings.

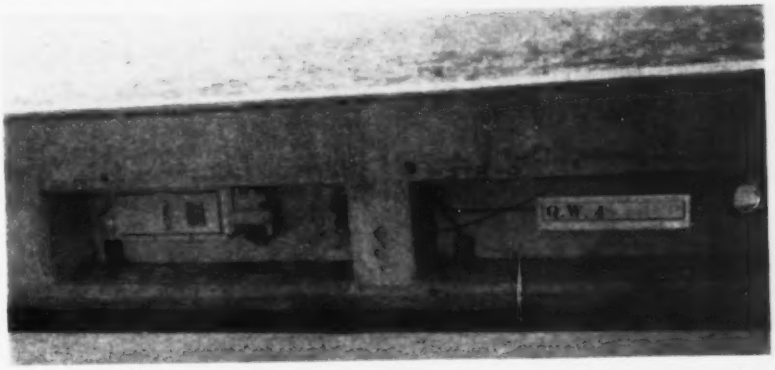
Approximately 12,000 ft of 15-kv, three-conductor 1/0 cable, 19-strand copper, paper insulated, shielded, lead covered with a reinforced neoprene jacket were installed in the underground duct system by the electrical contractor, Standard Electric Contracting Inc. of Chula Vista. In addition a complete fire alarm system was installed throughout the site.

To supply ocean-going vessels docked along the quay wall (nine can be docked at one time) power and telephone terminals are provided in recessed "mounds" at each ship-docking station along the quay wall. The power outlets are of the arctight type.

Street and floodlighting, with automatic and manual control, is likewise provided. An innovation is the use of fluorescent units over the warehouse doors to give additional illumination there during loading.



Inside one of the vaults—the load break switches are left, transformers at right



Power for ship docked at the quay is available in left "mound"; telephone connections to shore at the right. Holes are provided for the cable to enter

Transit sheds and quay are lighted with mercury street units and additional fluorescent units over each of the doorways to give more illumination during night loading

Motor Damage from Heat

Tom Hughes, Electrical Safety Engineer, California Division of Industrial Safety

Motors and Controls—IV

While we can't go into the broad field of motor applications and we can't possibly approach the technical features of rotor and stator winding layout (which gets into the highest mathematics), we must touch briefly on fundamental problems and a simple picture of their solution. The proper choice from the hundreds of motor types and styles must be left to the motor application engineer but we can break the field down into four or five general classes according to our objective aims.

We said that the two main problems of motor application are satisfactory acceleration of the load and dissipation of heat. When it comes to starting a simple load, such as a blower or water pump, and letting it run for a steady eight-hour shift, there is no problem except for the fellow who has to pay the bill. Efficiency in continuous duty is the prime consideration and the manufacturers have certainly squeezed out the smallest, trimmest, most efficient specimens (in this category) that can be produced by existing methods.

Such a motor is called a "general purpose" 40 C ambient plus 40 C rise (in frame temperature) class. More of this class are sold than all the other types of motors put together and it is our aim to show that far too many general-purpose motors are bought and applied to loads that require another class.

Now, what about the production of heat and hot spots in the general-purpose motor? Certainly we produce heat and we produce hot spots in starting! But, since a general-purpose motor is only figured for occasional starts under light load and is intended to be placed in a room of normal ambient temperature and reasonable ventilation, it usually can take care of itself.

The insulation on the winding of the stator of ordinary three-phase motors is sealed with a motor varnish that provides a tough glossy surface. As long as this varnish looks and feels glossy you can be reasonably sure that the winding has not been overheated. The occasional production of hot spots, for an instant of starting, does not drive the moisture of the insulation through this exterior "skin" and the heat from the hot spots (center portions of the coils) is soon distributed by flow in the copper and exchange with the motor self-ventilation.

Trouble starts when either the motor is placed where it can't properly self-ventilate itself with normal cool air or it is started too often for the hot spots to even out. Then it produces steam from the moisture in the organic insulating materials and the steam percolates out through the exterior skin of the varnish, like bubbles. The inner insulation chars and loses its dielectric quality and the skin of the varnish becomes porous and allows undesired moisture from foggy weather to penetrate the winding and produce electrical leakage to the iron core, with final direct passage of current to ground.

We realize that this simplified explanation sounds like a jumbled mess of contradictions but naturally we can't go into the chemistry of it all. We have been in intimate contact with all kinds of motors for more than 30 years and that is the best description we can give.

The average general-purpose motor (in late models) carries the designations: Code F and Design B on its name plate. This indicates average starting torque and good efficiency in steady running. In this motor, no special treatment has been applied to improve starting torque, suppress the development of heat in starting, or prevent momentary voltage sag on the line feeding it (if it is a large motor).

Motors with code letters of A through E, or other "Design" letter classes, are specially designed for application to particular sets of starting conditions or erratic loads. There is not much difference in the disposition of stator windings in any of them (for the same rpm). The connections of the stator can govern the synchronous speed while the disposition of the coils in the slots can affect starting torque vs noise of operation. However, the rotor is the actual producer of torque (power) and the stator is just there to establish the revolving 60-cycle magnetic field.

The real manipulation of the various factors that contribute to performance characteristics takes place in the rotor. Whole textbooks are written on all the fine points of rotor design and you find different sets of experts for d-c armatures or a-c rotors. But the simple elements we are concerned with are rotor winding *resistance* and *reactance*.

By numbering and disposition of slots in relation to those of the mating stator, we can vary the reactance; and by the size and material of the slot conductors we can vary the resistance. In the normal "squirrel cage" rotor, the resistance of the winding is an established value while the reactance varies with the speed.

Now, don't get disgusted and leave us at this point. We aren't just tossing in facts to fill out space in an article. This kind of stuff in textbooks has always made us drowsy, too. But you have to assimilate these elemental factors of the rotor if you are ever going to use motors with understanding. You can always hire someone else to tell you what you need but the best applications are going to be made by the persons that have to live with them or guarantee their performance.

If you remember your physics you remember that any coil of wire or group of parallel conductors presents an additional resistance to the flow of a-c current over that which it presents to d-c. This a-c resistance of coils is known as inductive reactance and, if you sharpen up your memory a little more, you will remember that it varies in proportion to the frequency of the a-c (number of cycles per second).

At the first instant of energizing, a squirrel-cage motor is nothing but an inefficient transformer. If the frequency of the stator current is 60 cps the frequency of the induced rotor current is also 60 cps. But the disposition of coils in the stator hookup produces a revolving field and the rotor immediately begins to turn and seeks to catch up with that revolving field.

If it ever locked in step with the revolving field, the frequency of alternations in its squirrel-cage winding would become zero. However, while a *synchronous* motor must lock in step, an *induction* motor can never attain synchronous speed. It would produce no torque if it did; but the reasons for that are of no concern to us, here.

So the squirrel-cage rotor of an induction motor always "lags" the revolving field (produced by the stator) a few rpm. The per cent of this running lag varies with the load conditions. And, as the per cent of slip or lag varies, so does the frequency of the induced alternations in the rotor winding or squirrel cage (shortened to just plain "cage" by some authorities). This rotor running frequency is therefore a small per cent of 60 cps.

Joint action to keep rates low and build load advocated in general and group meetings as . . .

APPA Meets in The West

Dr. Paul J. Raver of Seattle City Light (second from left) was elected APPA president for the coming year. Seated with him are William S. Peterson, Los Angeles Department of Water & Power, a panel moderator; Ivan C. Laird, Coos-Curry Electrical Cooperative, new president of the Northwest association, and William A. Pearl, Bonneville Power administrator. Standing, Vincent M. Cleaveland, who presided at NWPPA meeting

SUBJECTS ranging from atomic power development to residential rates were covered by prominent speakers at the 16th annual convention of the American Public Power Assn. in Seattle, May 26-28. More than 700 gathered from all parts of the United States for the three-day meeting built around the theme, "Low-Cost Power for Prosperity."

Dr. Paul J. Raver, superintendent of Seattle City Light, was elected association president on the final day. He succeeds S. T. Anderson of Springfield, Ill.

Appropriately, the keynote address was by a representative of the westernmost state, Senator E. L. Bartlett of Alaska. Calling for bold action and a continuing program of planning and execution to develop Alaska's gigantic hydroelectric power potential, he said that the Corps of Engineers had listed 90 major power sites there, with prime power potential of more than 12 million kilowatts—only a little less than the installed capacities of all federal hydro plants in the United States. Three of them—Rampart, Kaltag and Woodchopper—offer potential of more than six million kw, he said.

Less than one per cent of potential is developed now, he said, and about 80% of utility capacity is publicly owned. There is a market for this energy now and a far greater one to be created, he stated. "We cannot countenance 'no new starts' policies."

A missile detection center in Alaska is a part of the defense effort, he pointed out, and the military will be put to tremendous extra expense for makeshift power systems—one result of what he characterized as a "penny-wise, pound foolish" failure by the government to develop Alaska's water power.

The senator's contention that, since power projects pay their own way, they should be included in a capital budget, brought one of the session's resolutions urging Congress to such action and proposing a "program of hydroelectric development in the State of Alaska to provide adequate power supply at the lowest possible cost."

Atomic Power

Another resolution urging the government to "adopt a clear and positive policy and program for developing atomic power" and to undertake construction of atomic power plants of representative sizes and types" underscored the interest in a topic that claimed major attention on the program. Congress was asked to extend the government's authority to compel the cross-licensing of privately owned patents in the atomic energy field for an indefinite period.

The subject was introduced at the first general session in the report of the association's general manager, Alex Radin, who sees in the program "some very real potentialities in the way of making low-cost power available for the smaller utilities which numerically comprise the bulk of our membership."

Although the Shippingport atomic power station has produced about 325 million kwh since it started up in December 1957, its most valuable product is information, Vice-Admiral H. G. Rickover, assistant director for naval reactors of the AEC's Division of Reactor Development, told the conference. He went on to describe the ways in which information developed on the project is made available to the public and told of plans to increase its electrical output. It is believed that the new core, currently under development, may be able to produce as much as 150,000 kw, he said.

He emphasized the importance of making safety the overriding consideration in designing and building any reactor. He warned that "we must not become so fascinated with watching or manipulating cost figures that we lose sight of the basic fact that atomic power development is a *technical* matter and we can best judge the state of the art by looking at the technology being developed and at the problems that remain."

Among the plans for the future he listed an expensive program to develop new physics concepts leading to longer life, better utilization of natural uranium, more uniform power generation throughout the core volume, reduced number of

Group sessions were an important part of the program. Here the public relations panel is addressed by Samuel L. Friedman, Los Angeles Department of Water & Power. Joe DeLeon, Seattle City Light, sits beside him. Milt Bona, public relations counsel for Clark County, Wash., PUD, is at left

control rods, etc. Metallurgists and mechanical engineers are exploring simpler designs and cheaper fabricating methods, he said.

Stating that our nation has spent thousands of hours of pointless debate over a problem that does not really exist—public or private development of atomic power—Washington's Senator Henry M. Jackson said that there should be no "favored few." A member of the Joint Committee on Atomic Energy, Jackson declared that it should be a national policy to assure that a wide range of groups and firms have an opportunity to get practical knowledge in atomic power.

He pointed to the fact that in the State of Washington public and private power groups are studying ways to operate jointly the atomic power features that can be built into the new dual-purpose reactor at Hanford. "The real question we face is technical, not ideological," he said.

Jackson termed the AEC's proposed program for fiscal 1960 a minimum program and said the joint committee has urged substantial additions. Noting that in the past few months there has been a wave of consolidations of smaller design and development organizations with larger equipment concerns, he warned: "Unless we undertake more prototype plants in this country, there may soon be only two or three giants in the equipment business left in the atomic power field." He sees this as an unhealthy situation, believing that when atomic power can become generally competitive, the know-how should belong not just to the federal government or a few mammoth industries but should be broadly shared by all in America who have a legitimate concern in the field.

Power and Employment

Speaking on low-cost power and full employment, Leon H. Keyserling, former chairman of the President's Council of Economic Advisors, called upon private and public power to lift its sights at least one-third.

He declared that government policies since the Korean War have restricted the nation's economic growth to 1.3% per year instead of the 5% needed for full employment. The nation's power capacity has increased faster than its economic growth but not fast enough, he said.

Keyserling believes that power capacity during the 1950-58 period should have increased at the rate of at least 13% annually, instead of 8.8%. He places the blame not principally with the power industry but with the government, which "fears inflation so much it is holding back economic development."

"Committing ourselves to an economy of scarcity rather than abundance is our No. 1 mistake," he believes. As a result, "a second-rate power that should be 50 years behind is now catching up with us." He warned that if Russia should go ahead of us in such matters as bringing electricity into the home, it would be a knockout of the United States.

Keyserling sees the present economic situation as similar to that of 1955, when the nation was in an upturn of production. "Some felt we were moving too fast, so restrictions were adopted, leading to a stagnation which developed into a recession.

"We need to set our targets for full economic growth and define the obligations of government. There'll be room for both public and private power."

Full Development

Asking for full development of water resources for a prosperous America, Under-Secretary of the Interior Elmer F. Bennett said that the job was too big for any segment of government or private industry to undertake alone. The policy of the federal government, he stated, is to encourage development by those who are willing and able to meet the needs as they arise. Nor does the government believe that federal development is necessarily better development, he added. "Because of the technological advances in the production and transmission of electric energy and because of the ever-increasing value of water resources for other than hydro power, I am confident that, by working together, we shall achieve full development of our water resources and maintain an adequate electric power supply," he concluded.

Rate Base—The Future

A new concept of residential electric rates, based on future business rather than last year's volume, was outlined by Leland Olds, director of Energy Research Associates, Washington, D. C. Under this concept, he reasoned, "rates will be low because your costs will be low because your sales will be high because your rates will be low." The approach is: (1) set your goal; (2) find out what price or rate is necessary to reach that sales objective; (3) use modern technology to adjust costs to make the rates economically feasible with an increasing volume of sales.

Joint Action

Olds proposed that, paralleling the private power company approach to giant power, consumer-owned systems go to work on their own interconnected systems or statewide and regional joint power supply programs. Long-range power supply studies for the all-electric rate concept could then be undertaken effectively by state-wide and regional groups rather than by individual systems, he said.

Joseph C. Swidler, former general counsel of TVA, also called upon public systems to find ways to integrate their systems. He suggested that, where state legislation does not provide an effective and flexible vehicle for joint action with other municipalities and cooperatives, local committees draft such legislation and work for its enactment.

Swidler brought up to date figures he had presented at last year's convention on the decline in number of municipal power systems. Indications are that the trend has been accelerated, if anything, he said. Most of the systems that went out of existence in 1956 did not have their own generating facilities, he pointed out.

He made it clear at the outset that he favored the present dual system of part public and part private ownership in the electric power field.

Keep Rates Low

A continued all-out effort to keep rates as low as possible was urged by Governor Albert D. Rosellini of

Washington, who warned against the tendency to think that, with average cost less than one-half the national average, "a slight increase will not make much difference."

The role of board members is in the field of fundamental philosophy, objectives and policies, their concern is with the longer range plans of development, it was pointed out by W. S. Peterson, general manager and chief engineer, Los Angeles Department of Water & Power, moderator of a panel on that subject. For basic knowledge they must receive a wide range of reports on operations, planning, financial condition, budget control, costs and many special matters, he said.

Load Building

Need for an accelerated load building program was pointed up in general sessions and in group discussions. Alex Radin in his general manager's report expressed the belief that the APPA should take a more active role in the power sales program. He suggested that it provide its members with new services such as detailed information on setting up dealer relationships, organization of home shows, sponsorship of specific appliance campaigns, fostering of industrial development.

G. O. Wessenauer, TVA's manager of power, believes that "today's electric business requires an outlook by top management most frequently found among salesmen rather than among engineers or operators." Today's major challenge is not one of engineering or construction or operations but one of promotion and customer relations, he declared.

Group discussions in this field centered around advertising to build load, the Medallion Home program, promoting commercial electric cooking and water heating, public relations, the utility's role in industrial development. Other groups considered rates, cost of service analysis and tools for rate analysis.

Raver Honored

Dr. Paul Raver received APPA's Distinguished Service Award at the closing banquet. He is the fifth man and the second Westerner to receive this honor, which is also held by Samuel B. Morris of the Los Angeles Department of Water & Power.

Seattle City Light won a first award for major cities in the association's annual report contest; Chelan County PUD topped class B utilities in this activity.

NWPPA Looks at Costs and Markets

TWO approaches toward maintaining the present rate schedule of the Bonneville Power Administration were suggested at the 19th annual membership meeting of the Northwest Public Power Assn. in Seattle May 25, preceding the APPA Convention.

Vincent M. Cleaveland of the Clark County PUD, retiring president of the Northwest association, proposed "centering our attention and effort more on consumer education in the use of electricity," with a goal of the 25,000-kwh home as "the average home on our system."

Cleaveland pointed out that 15% of BPA power goes over the spillways of Columbia River Dams at high-water periods of the year.

"In the long run we pay for power from the federal dams regardless of whether we use it," Cleaveland declared. "We might as well use that power so BPA can operate in the black."

William A. Pearl, Bonneville Power administrator, acquiesced in Cleaveland's comments on BPA power but appeared to regard California as the best market for BPA's secondary power. He reviewed a proposal under which Bonneville would deliver secondary power "in excess of the needs of our marketing area to the Pacific Gas and Electric Co. for steam displacement on an as, if and when available basis at our regular rates for a period of 10 years." The power would be delivered at the Oregon border by wheeling it over California-Oregon Power Co. lines.

Bonneville will be unable to meet the Congressional deadline of July 15 for completing a study of the "feasibility and desirability of a high-voltage interconnection for disposal of surplus secondary energy between the federal power systems in the Pacific Northwest and California," Pearl reported. An extension of time will be requested, he said, as "it will take a long time for us to prepare our recommendations."

Dean Barline, Tacoma director of utilities, was elected vice-president of the NWPPA

Bonneville must reach a decision before Dec. 20 on whether to increase its wholesale power rates for the next five years, the association was reminded.

Cleaveland, in proposing the 25,000-kwh home as a goal for the future, pointed out that many such homes already exist in the Pacific Northwest. The city of Grand Coulee, Wash., believed to be leading the world in high use of power in the home, expects to pass the 15,000-kwh milestone for its average home this year, he said. Of the 73 consumer-owned electric systems buying power from Bonneville, 25 reported an average home use in excess of 10,000 kwh for 1957, largely because of electric heating, Cleaveland pointed out.

"In Clark County, 7.3% of our residences already are in the 25 Grand Club," he said. "At 10% rate of growth compounded, we can be above the 25,000-kwh level in ten years."

Gus Norwood, executive secretary of the association, pointed the finger at interest rates as the determining factor in power costs, declaring that a 1% increase in interest rates on Bonneville indebtedness would mean a 16% increase in the cost of power. He called for amortizing the cost of dam construction over periods as long as 100 years, instead of the 32 years specified for Grand Coulee Dam, and for allocation of more costs to other benefits, such as flood control.

Norwood expressed the belief that a "substantial" portion of the cost of constructing Grand Coulee Dam would soon be transferred from the "power column to the flood control column," because of the dam's value in controlling past floods.

Ivan C. Laird of the Coos-Curry Electrical Cooperative, Coquille, Ore., was elected new president of the association, to succeed Cleaveland. Dean Barline, director of Tacoma public utilities, was named vice-president and Ed Cooney of the Cowlitz County PUD, treasurer.

Delegates at IES Pacific Regional Conference relax before banquet. Session discussed . . .

Higher Level Benefits

BENEFITS from acceptance of higher levels of illumination now being recommended were cited at the 13th Pacific Northwest Regional Conference of the Illuminating Engineering Society at Banff Springs Hotel in Alberta, Canada, May 27-29.

More than 200 attended the conference, first to be held outside the Pacific region. Calgary and Edmonton IES were joint hosts, with Don Frost, Amalgamated Electric Corp. Ltd., Calgary, and R. C. B. Jarvis, Jarvis Engineering Ltd., Edmonton, co-chairmen.

Importance of combined efforts to enlighten the public in respect to upward revision of lighting standards in keeping with demands of vision was stressed by key delegates, including Beverly A. Travis of Beverly A. Travis & Associates, Seattle and regional vice-president; IES President George J. Taylor, Day-Brite Lighting Inc.; E. A. Lindsay, G-E Lamp Division, Nela Park. They stressed the fact that the new recommended levels are based on scientific studies concerning light requirements for various tasks, made by Dr. H. R. Blackwell of Ohio State University.

IES President Taylor commented during an interview prior to his address at the first-day session that previous lighting standards have been so conservative, as shown by the Blackwell studies, that IES recommends, in general, a doubling of lighting standards.

He noted that IES has available its exact recommendations for "lighting anything and everything" and that thorough dissemination of this and other knowledge concerning illumination in the interest of public welfare and general advancement is one of the main aims of the 53-year-old society.

But in Taylor's words, a long and tough job lies ahead for the society in its efforts to achieve full and complete acceptance of the presently recommended lighting standards. His reason: previous standards now outmoded in the light of new scientific data received compliance of only about 20% of the main lighting classes—industry, schools, stores, offices.

"This means," he stated, "that about 80% of establishments in the U. S. are below even the past recommended levels of illumination. . . It follows that just a fraction comply with the new."

Asked whether the same condition appeared to prevail in Canada, he expressed belief that the two countries are comparable in their approach to lighting.

Figuratively speaking, "new lamps for old" would mean these sample changes for the following classes of lighting: Factory drafting room: to 200 from 75 f-c; Offices: to 100 from 30 f-c; Schools: to 70 from 30 f-c; Stores: Depending on type, this ranges as follows: to 100-200 f-c from 30-50 f-c and for some displays to 1,000 f-c from 500 f-c.

The best in these classes, he said, would be factories and offices in that order, likely because they can see more materially before them what the production increases can be as result of better lighting.

He said that in some cases, not even hospitals were complying with recommended standards.

Taylor called particular attention to findings of the Blackwell studies which showed that the human eye requires a minimum of two to three times more light than usually is provided for performance of indoor "seeing tasks." (See also his remarks at the Intermountain Conference, EWEST, June, p 91.)

In a joint interview, Taylor and Linsday observed that the need in industry for proper lighting levels has been accentuated by today's complicated manufacturing processes, high-speed production and extremely fine tolerances and inspection procedures.

They estimated that production increases have ranged from a "few" per cent to more than 25% when lighting was improved. As noted by Taylor, the highest production increases were realized in sections of industry where tasks make the greatest demands on the eyes. An area in the textile industry where, for example, dark cloth is being worked with was cited as one of the cases where performance depends greatly on proper lighting. It is in such difficult-task areas, continued Taylor, that higher levels of illumination result in the greatest production increases.

The best compliance with new recommended levels of lighting has been credited to factories.

Progress Report

Presented by Linsday, the annual progress report—entitled "Reaching for the Sun"—showed that homeowners also are recognizing advantages inherent in greater use of light.

The report was a pictorial review of advances in lighting during the past 15 months.

"More and more, homeowners are realizing that light is essential to live by as well as to see by," stated Linsday. "They are finding the beauty of the home is lost if the lighting is not adequate."

"If our effort toward reaching the sun is to be successful, we must have new and improved sources," he said, observing that these sources ranged from photo flash bulbs to auto dash lights.

In interviews, both Taylor and Linsday forecast new improved lighting trends. Taylor predicted that by the turn of the century, 1,000 f-c would be used generally "as people will be more light conscious by that time."

Taylor commented further that "as higher levels of illumination are adopted in the future, we will see lighted walls, floors, desk tops and so forth." He feels that lighting-walls will be prevalent possibly by 1975.

In the meantime, it is felt that

Officers and chairmen attending the meeting included, left to right, Fred Dorward, Edmonton Chapter chairman; Graham Foster, chairman-elect, B. C. Section; Beverly A. Travis, regional vice-president; William Warrack, Chinook Chapter chairman; R. C. B. Jarvis, past chairman, Edmonton Chapter and co-chairman of Banff conference; R. E. Jones, Puget Sound Section chairman; George J. Taylor, IES president; T. W. Beadle, Inland Empire Chapter chairman; Jack Cottingham, immediate past chairman, Oregon Section. Dorward received charter from Taylor, signifying change-over of Edmonton from chapter to section

attention will be centered on acquiring more balanced light in homes. This would involve greater use of special purpose fixtures such as luminous ceilings, valance and cove lighting and special lighting effects capable of making areas appear "hot" or "cold" as desired.

This requires team work. The lighting engineer, the architect and the decorator all play an important role in achieving the right kind of lighting environment.

Serving as chairmen of sessions at which addresses and presentations were made during the course of the three-day meeting were Graham Foster of Northern Electric Co. Ltd., Vancouver; T. W. Beadle, of Washington Water Power Co., and chairman, Inland Empire Chapter; Tom Mawson of Mawson Sage Ltd., Victoria, and chairman, Vancouver Island Chapter; Robert E. Jones, Seattle, Sunbeam Lighting Co., and chairman, Puget Sound Section, and J. T. Cottingham, Portland General Electric Co. and past chairman, Oregon Section.

Pitfalls in Calculations

There are hazards and pitfalls in foot-candle calculations. This was borne out in a talk by R. E. Jones, Seattle, Sunbeam Lighting Co., and chairman of the Puget Sound Section.

For accurate foot-candle predictions, 15 principle factors must be considered, Jones pointed out. These factors applying to fluorescent lighting systems are: lamp output, ballast characteristics, room index errors, room reflectances, maintenance factors, errors in the method measuring "average" foot-candles, foot-candle meter errors, coefficients of utilization, interference factor, ignorance multiplying factor, Finch Fudge Factor, index of glaze, Jones Juggled Jottings, pessimistic or optimistic factor (POOF), applied correction to augment the lumen average method.

Accuracy is required in this competitive day and age, he said, if the designer is not to be caught between a landlord of an office building and a prospective tenant who has stipulated in the lease that a minimum number of foot-candles be provided for his workers.

Stage Lighting

The play's the thing—but lighting certainly plays a part. This was pointed up by Ariel R. Davis of Ariel Davis Mfg. Co., Salt Lake City, in discussing stage lighting and its various aspects.

Davis said that most institutional auditoriums in America have inadequate stages and lighting equipment for the production of modern drama. He said that far too often this condition is caused not by inadequate budgets but by improper planning and results in expenditures for non essentials or outmoded equipment.

Davis emphasized that good stage lighting starts with the design of the building. Unless the architect designs facilities for placement of stage lighting instruments, the engineer will be unable to provide for their proper placement and control. He said that curtain and rigging installation must be part of the planning also if good lighting results are to be realized.

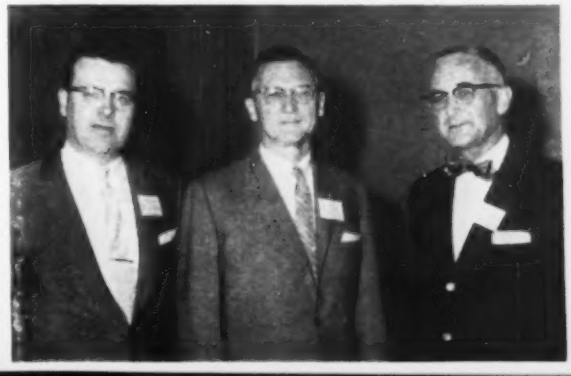
Within the past five years there has been a decided trend toward use of firm specifications in building contracts as opposed to the "open" or "or equal" type. By using firm specifications, architects and their clients have found that a higher degree of standardization is afforded, Davis pointed out. The same benefits in lower costs, higher quality and improved functional efficiency come when firm specifications are used for lighting layouts, he said.

Street Lighting

A long-range, multimillion-dollar program to relight the city of Calgary completely, utilizing mercury vapor street lights, was described by George Cornish of the Calgary Electric Light Department.

Cornish told the conference that the accomplishment is even more amazing when the tremendous growth of the city is considered. He said that in the past 10 years Calgary's percentage growth has been the highest of any city in Canada. In 1948 the population of Calgary was 104,000 and the area was 40 square miles. Since that time Calgary has almost doubled in area and more than doubled in population.

Forced since 1946 into rapid expansion of its street lighting system, the city of Edmonton has come



IES President G. J. Taylor, Day-Brite Lighting, (center) with J. Carl Wilson, Wilson Lighting, Toronto, Canadian region vice-president (right) and Beverly Travis, Beverly A. Travis & Associates, Seattle, regional v-p

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George Taylor presents "My Most Interesting Lighting Job" awards to J. E. Beck, Jack Cottingham, Oregon; Don Frank, Spokane; Ernie Kingsley, Vancouver. (See text below)

through with a program that economically guards against obsolescence for at least 20 years. This program was outlined in a paper presented by Frank D. Wilson, Edmonton Electric Light & Power Dept.

In 1946 the population of Edmonton was 114,976 and by 1959, as a result of growth fostered by oil discoveries, this population increased to 260,733. To light the new residential areas and the arterial roadways serving the new subdivisions, street lights were increased more than 400% in 15 years. In 1946 the lumen output of the system was 12.2 million as compared with the present figure of 107 million lumens. The average lumen output per lamp in 1945 was 4,640. In 1959 this figure had increased to more than 9,700 lumen per fixture. Most of the lighting installed in the past 10 years has been mercury vapor.

Ballasts

Fluorescent lighting users can protect themselves against unnecessary cost and the inconvenience of premature ballast failure by following four procedures, said G. I. Campbell, Canadian General Electric Co. Ltd., Toronto. They are: (1) Specify ballasts designed and tested to withstand voltage surges normally encountered in operation; (2) insist on proper application and installation of the ballast in the fixture and of the fixture itself so that the hot spot ballast case temperature does not exceed 90 C; (3) conduct a maintenance program that provides for immediate replacement of deactivated lamps or, if this is not practical, specify ballasts of a type in which protection for deactivation conditions is provided; (4) provide individual ballast protection by fuses in the fixture.

In regard to mercury lighting, Campbell noted that there are two types of ballasts available, the so-called conventional ballast and the regulating type. He told the conference that regulating mercury ballasts, although somewhat higher in first costs, have become very popular because of their favorable characteristics.

Flood Lighting

During an evening session, a flood light demonstration was conducted by Don Frost. The demonstration—Painting with Light — emphasized close proximity flood lighting. Colors were amber, blue-green and white. Twelve mercury and 12 sodium flood light units were used a distance of 15 to 16 ft from the face of a wall of the hotel. The units floodlit an area 85 ft high and 75 ft wide. Brought into play were a total of 5,220 w and 158,400 lumens in the 12 mercury units and 1,920 w and 134,400 lumens in the sodium units.

Award Winners

The Oregon Section came out tops in "My Most Interesting Lighting Job" contest with two first-place winners. Winner of class 1, residential lighting, was J. E. Beck, Pacific Power & Light, Portland. Winner of class 2, commercial and industrial lighting, was F. M. Farlay, whose paper, "Effects of plenum obstructions of a luminous ceiling in a bank," was presented by Jack Cottingham, PGE.

Second prize in class 2 was awarded Don Frank, Columbia Electric, Spokane. Honorable mention went to Carl Haselsteiner, Vancouver.

Seattle will be host to the 1960 regional conference, scheduled for May 7-9 at the Benjamin Franklin.

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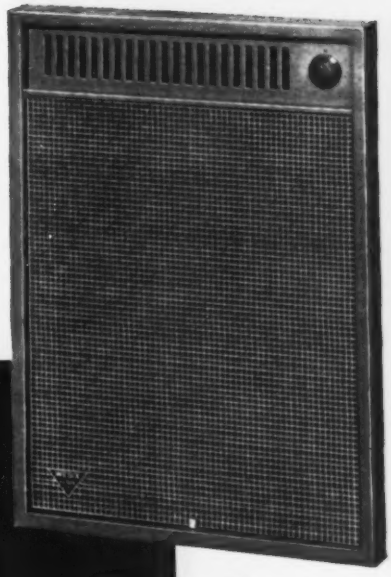

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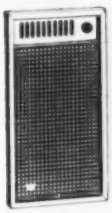

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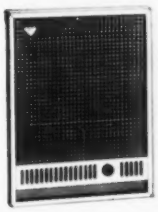

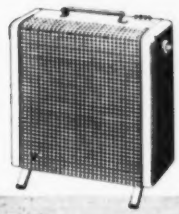

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ELECTRICAL WEST
Construction News

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- consulting engineers
- lighting engineers
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A job management course completed in the Cascade Division of the Oregon-Columbia Chapter, NECA, brought diplomas to 15 contractors and superintendents at a dinner by the chapter honoring the students. Oscar Paulson, director of state vocational education, Oregon, presented the diplomas. W. R. Grasle, vice-president, District 6, NECA, addressed the group, contrasting contracting in early days to the complex business it is today. Norman Berg was instructor for the course. Participants included members of Bartlett Electric Co., Salem; Electric Corp., Salem; Linnco Electric Co., Albany; Riches Electric Co., Salem; and Vibbert Electric Co., Salem.

December deadline

1962 may seem far off but any changes to be made in the 1962 National Electrical Code that are to be processed through the International Association of Electrical Inspectors must be submitted at the fall sectional convention for the deadline for receiving them is December of this year. E. E. Carlton, IAEI third vice-president, advised strongly that any proposed code changes be put in writing and supported with the reasoning for its proposed change. Otherwise, code representatives of the IAEI are unable to present a case for it in the council.

Aluminum conduit, according to a survey made by National Association of Electrical Distributors, is now being carried by a majority of the supply houses in the United States and others are contemplating carrying it. Acceptance of the conduit is different according to regions and to promotion. Kaiser, with more aluminum production being developed, will push it very hard. Other makers of conduit include Alcoa, Reynolds and now Olin Mathieson. Steel conduit has a competitive battle on its hands.

Kitchen for fair goers

The labor management joint committee of NECA and IBEW in San Mateo County will again sponsor an electrical exhibit at San Mateo County Fair. This year it will be an electric kitchen exhibit similar to the one shown at the Union Label Show in San Francisco by the IBEW. The labor management committee will have the cooperation of Pacific Gas and Electric Co. in a 1,000-sq-ft exhibit in the Home and Industry Building at the fair.

Day-Brite Lighting Inc. is doing a smart thing. In reorganizing its office setup in the West Coast, it is setting up a new San Francisco district office and a showroom and meeting room at 31 Geary St. near Kearny, near the architects and engineers. The convenient showroom will be handy for conferences and for showing of products. James H. Brundage, who formerly handled the line on an agency basis as sales representative since 1952, will now become district sales manager. Day-Brite now has a plant in Santa Clara as well as its headquarters in St. Louis.

Something to think about

Something for contractors to think about had they been there to hear it was contained in the PCEA address of James H. Goss, General Electric vice-president. First was a suggestion to the utilities that they capitalize and own everything from the transformer on the pole to the branch circuit panel in the home as a means of modernizing home wiring more quickly. The other was a sensational concept of homes being made up in factory-built modules, prewired and plumbed which could be assembled in a great variety of combinations and include even the built-in appliances, lighting, etc. Such homes could be erected in a matter of a few hours rather than days or months, added to when desired and even moved to a new location.

George Taylor

George Taylor, Illuminating Engineering Society president, visited several Western chapters and sections during the interval between the regional conference in Denver, Intermountain Region, and the Pacific Northwest regional meeting at Banff. He was given a dinner and birthday party by the Utah Chapter in Salt Lake City May 13 following a golf tournament. In Oakland he addressed the newly formed East Bay Section, IES, on May 18. The Inland Empire Chapter was addressed by him on May 25. He, likewise, had small meetings with officers in Portland and Seattle.

Supplies distribution by means of a supermarket-type delivery truck was begun by Inland Electric Co. of Spokane last month. On alternate weeks the truck with a complete line of wiring supplies and materials makes trips extending from Spokane to Pendleton and east to Grangeville, Idaho.

Light the outdoors

Garden and outdoor lighting was given a big play in several recent events. In San Diego, following the outstanding display in the Contractors Division part of the Spring Fair in Balboa Park, Bill Shalda was called back to conduct a garden lighting demonstration in the park on May 14 to which everyone was invited. The Illuminating Engineering Society joined in the program. In Sacramento a similar outdoor lighting clinic was conducted under auspices of the Sacramento Municipal Utility District, the IES and the electric league on May 27. Fresno had held its earlier on April 3-7. Six appliance dealers and distributors displayed appliances and kitchen ideas at the Spring Home and Garden Show and PG and E featured lighting of yesterday and today to an attendance of approximately 30,000 . . . Bill Shalda, by the way, has been appointed chairman for the 1960 South Pacific Coast IES Regional Conference somewhere near Los Angeles. He did an outstanding job in 1955. Another of his accomplishments was lighting for the U. S. Pavilion at Brussels.

L. W. Hembree W. R. Grasle

High bidders got the preference for a change in a new twist instituted by the Oregon-Columbia Chapter, NECA, for District 6 contractors. It is an annual "High-Bidder Handicap Tournament." Qualifications are that any contractor must have been high bidder three times on projects during the past year, must have agreed not to cheat on the industry, on his wife or on the golf course, according to J. W. McKinnon, co-chairman of the tournament with S. I. Jaggar. First tournament was played at Gearhart April 18 and Wayne Hembree ran away with the trophy. His trophy was a gold plated octagon outlet box mounted on three fixture studs.

This "gold meter," General Electric's 10,000,000th magnetic-suspension meter, has just come off the assembly line at Somersworth, New Hampshire. It is a reminder that not one of the first 9,999,999 has ever been replaced because of bearing wear.

OVER 10 YEARS AND 10,000,000 METERS . . .

Not one General Electric magnetic-suspension meter has ever been replaced because of bearing wear

This month, eleven years since the introduction of the revolutionary I-50, General Electric's Meter Department produced the 10,000,000th meter with magnetic suspension. Of the first 9,999,999, not one "free-floating" system has ever been replaced because of wear. This service record stands as indisputable proof that General Electric meters, with magnetic suspension, assure a lifetime bearing system. Here's how it started:

Meter men for many years had requested a meter with a lifetime bearing system. In 1948, General Electric introduced the I-50—first of the magnetic-suspension meter family—as the answer to that request. Because of the widespread acceptance of the I-50 and the need to handle increasing loads, General Electric introduced the Class 100 I-55 in 1954 and the Class 200 I-60 in 1957. With the extension of magnetic suspension to the complete polyphase Class 10, 100 and 200 V-60 two-stator line, General Electric's full line of watthour meters has achieved an unexcelled record for accurate performance.

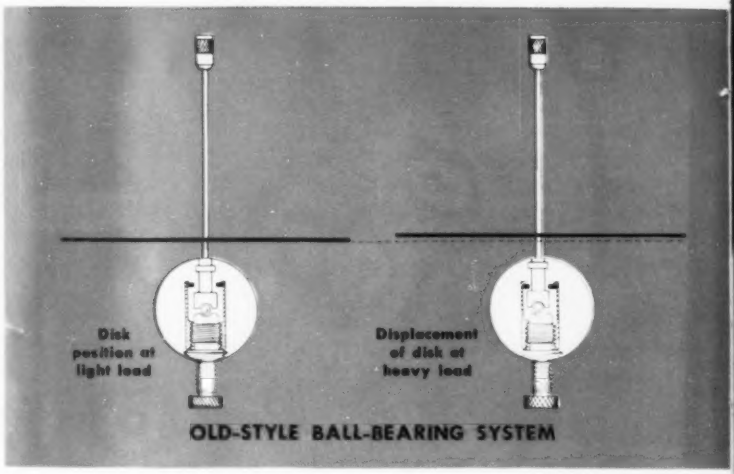
Progress Is Our Most Important Product

GENERAL ELECTRIC

HERE'S 5-WAY PROOF OF MAGNETIC-SUSPENSION

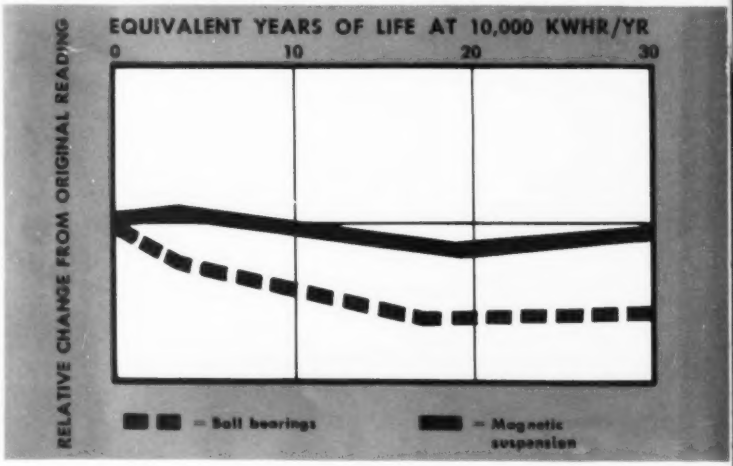
1 NO DISK DISPLACEMENT

With conventional ball-and-jewel bearing systems, higher loads can force the disk out of position and cause inaccurate meter readings. Because of the basic design of General Electric's magnetic-suspension system, however, disk displacement at any load is not a significant factor, and meter readings are accurate through full meter range. You also eliminate bearing inspection, cleaning and replacement costs.



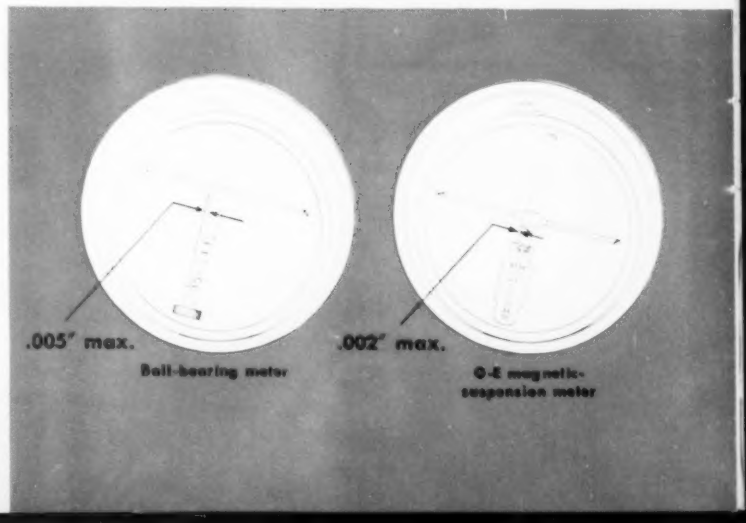
2 GREATER SUSTAINED ACCURACY

The proof is in the testing. Accelerated life tests prove that, over an equivalent of 30 years' operation at 10,000 kilowatt-hours per year, meters with magnetic suspension hold a higher sustained accuracy and incur considerably less bearing wear than meters with old-style, ball-bearing systems.



3 REDUCED TILT ERROR

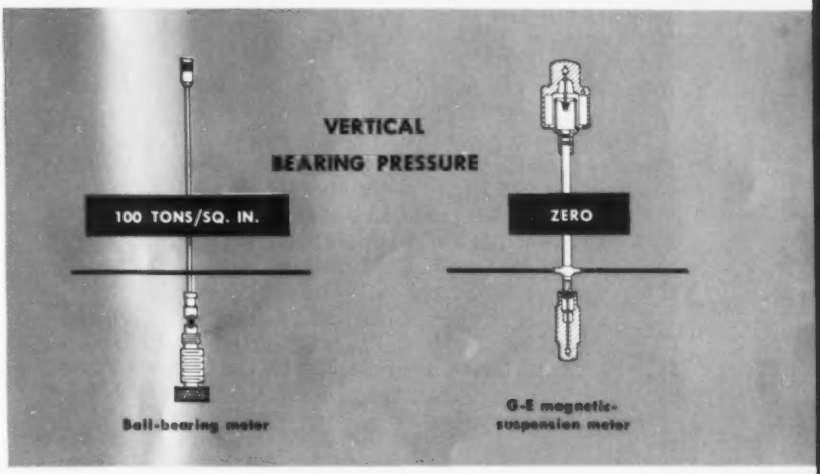
Because the disk and shaft in G-E meters are supported magnetically rather than by a ball and jewel, tilt error is minimized. As the angle of tilt is increased on ordinary ball-bearing meters, disk position changes—relative to the element and damping magnet—result in increased tilt errors. Close tolerance of parts in G-E meters minimizes disk position changes and tilt error, thus reducing revenue losses.



GENERAL ELECTRIC'S METER SUPERIORITY

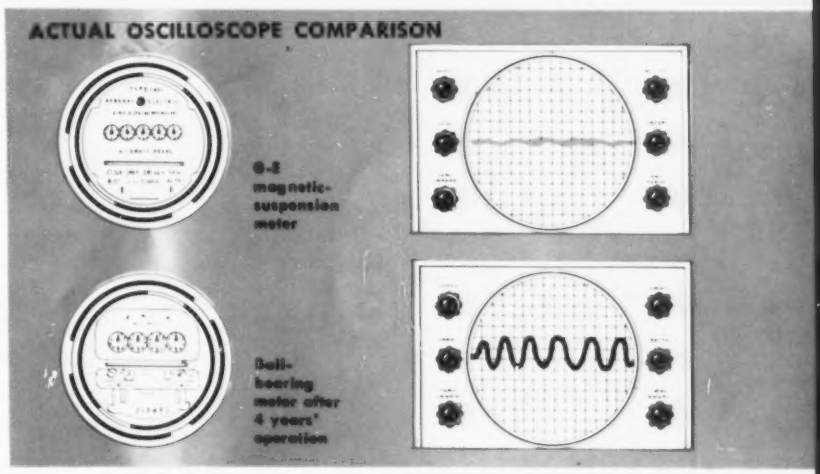
4 NO BEARING WEAR

In old-style, ball-and-jewel systems, the weight of the disk and shaft assembly exerts approximately 100 tons-per-square-inch pressure on the bearing. Bearing wear and attendant maintenance costs are inevitable. With G-E's magnetic-suspension system, vertical bearing pressure is zero because the entire weight of the rotor is supported by a magnetic field. Only G-E meters offer a true, lifetime bearing system.



5 QUIETER OPERATION

Electric Utilities across the country have recorded instances where home owners have registered complaints about "noisy meters" outside nurseries or bedrooms. Where noise constitutes a problem, it has become common practice to replace old-style, ball-bearing meters with General Electric magnetic-suspension meters. G-E meters operate more quietly because the disk floats free.



TEN MILLION METERS WITHOUT A SINGLE BEARING FAILURE PROVE THE SUPERIORITY OF GENERAL ELECTRIC'S MAGNETIC-SUSPENSION SYSTEM

For complete information on this exclusive meter line, contact your G-E apparatus salesman or write section 628-29, General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

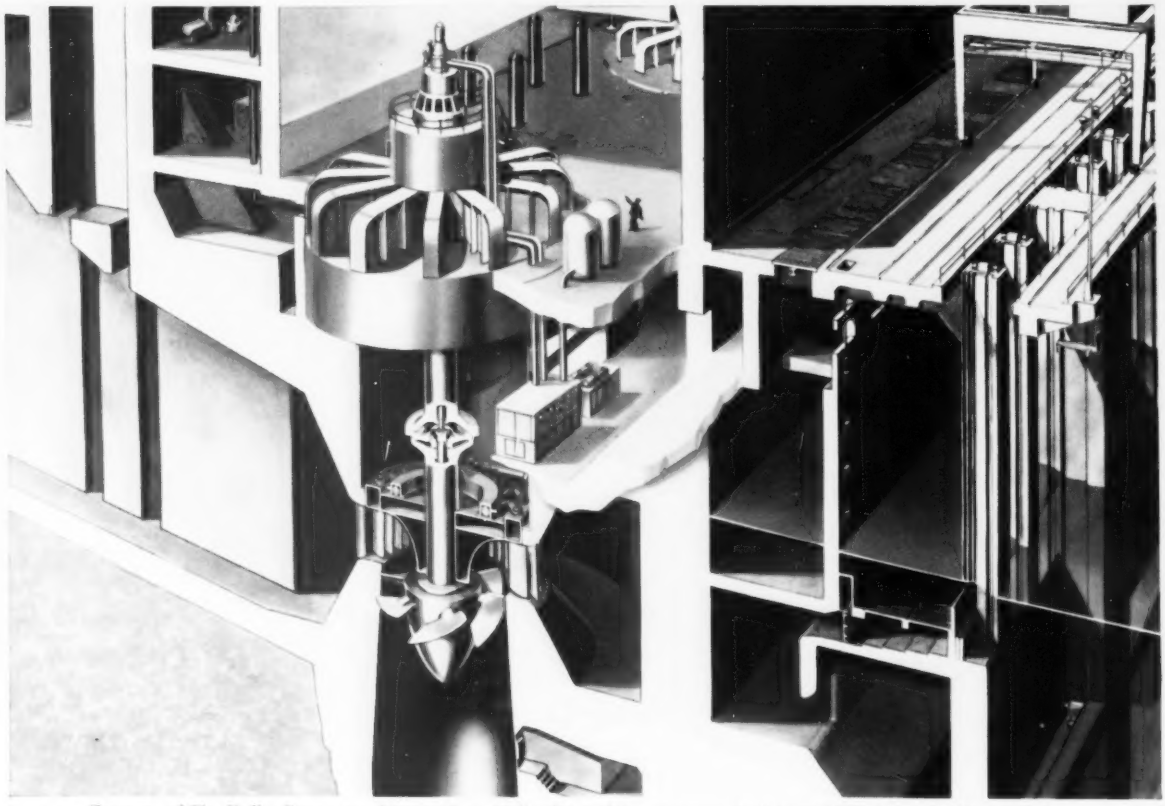
Pelton makes world's largest Kaplan turbine governors for The Dalles Dam

Of the 16 Kaplan turbine governors which Baldwin-Lima-Hamilton's Pelton Division is supplying for The Dalles Dam, located on the Columbia River, 14 are the largest ever built. Each has a wicketgate capacity of 950,000 ft.-lb. and a Kaplan blade capacity of 720,000 ft.-lb. In order to be absolutely certain that they will meet contract specifications in every respect, Pelton exhaustively tests these governors under simulated power plant conditions prior to installation.

In addition to governors, B-L-H is furnishing The Dalles Dam with 14 Kaplan type turbines, each rated to deliver 123,800 hp at 85.7 rpm under 81-ft. head. Station service units are also being produced for this project by B-L-H's Pelton Division. The Dalles Dam is thus a superb testimonial to Baldwin-Lima-Hamilton leadership in the design and manufacture of hydraulic turbines and related equipment.

For a copy of our newest illustrated bulletin, write B-L-H Corporation, Philadelphia 42, Pa., or Pelton Division (B-L-H), 2929 Nineteenth Street, San Francisco 10, Calif.

An inspection of one of the 16 Kaplan turbine governors for The Dalles Dam is made at B-L-H's Pelton Division.



Cutaway of The Dalles Dam powerhouse, where 16 Kaplan turbine governors built by Baldwin-Lima-Hamilton's Pelton Division and 14 Kaplan turbines built by the Eddystone Division of B-L-H are being installed. Artist's rendition courtesy of Portland District, Corps of Engineers, U.S. Army.

Pelton Division San Francisco, Calif.

BALDWIN · LIMA · HAMILTON

Hydraulic turbines • Valves • Governors • Centrifugal pumps

BALDWIN BLH LIMA-HAMILTON

NO TROUBLE CALLS WITH PUSHMATIC . . .

bolted connections are standard on every breaker

Trouble calls eat up your profits. But not when you install Pushmatic®—the circuit breaker that prevents overheating and subsequent nuisance tripping. You save costly call-backs and the difference goes right into your pocket. The reason?

Unlike plug-in type breakers, a Pushmatic *bolts* to a bus bar, cannot work loose and cause excessive heating. It provides a high-pressure, low-resistant, *positive* contact always.

No complicated installation, either. To install a Pushmatic simply tighten the handy captive screw onto the bus bar . . . and there it is, a truly trouble-free connection in seconds . . . and an end to a common cause of nuisance tripping.

Other Pushmatic plusses: Pushbutton convenience and control — quality you can depend on. More than a dozen individual tests are given each and every Pushmatic before packaging. The result is safe, proved performance *every* time. Sell Pushmatic and end trouble calls.

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

Consult the following Pacific Coast representatives:

Coast Electric & Manufacturing Co.
1733 N. E. Seventh Ave., P. O. Box 7712
Portland 12, Oregon

Young Electric & Mfg. Co.
2134 Curtis St.
Denver 2, Colorado

Safety Switchboard Company
910-89th Avenue
Oakland 21, California

BullDog Elec. Prod. Co. of Los Angeles
2885 E. Washington Blvd.
Los Angeles 23, California

THE MAN WHO HAS TO KNOW . . .
GEORGE K. KALLENBACH, OPERATING SUPERINTENDENT,
EASTERN DIVISION, TELLS WHY . . .

RESEARCH pays dividends for Niagara Mohawk's investment in General Electric voltage regulators

"To minimize reactive currents on a 33 kv loop, we were seeking the optimum setting for the line-drop compensator on our regulators. A General Electric system research study gave the answer; verified it on a network analyzer set-up of our system."

General Electric regulator research means not only such system studies but also continuing product innovation. You get dividends in these exclusive features: controlled-speed, Opti-life switching mechanism; electrostatic shielding to prevent flashover due to carbon accumulation; and exclusive Thyrite* by-pass resistors for internal series winding protection.

* Registered trademark of General Electric Co.

Through continuous research, the cost of regulation with General Electric regulators has remained essentially the same for 28 years.

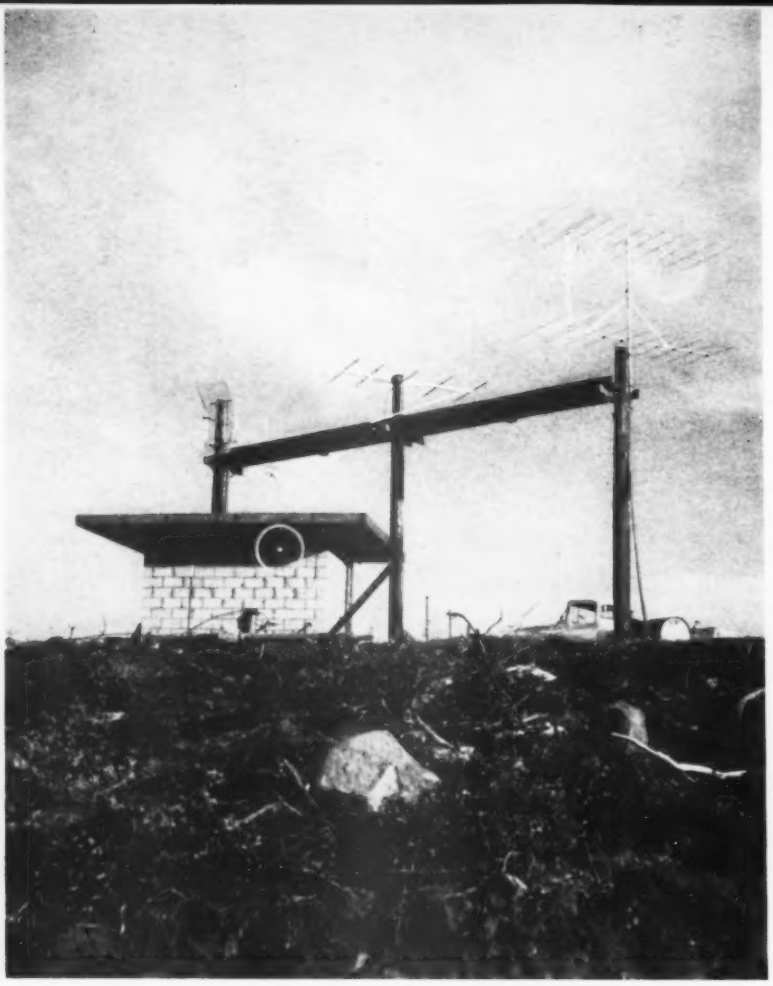
GENERAL ELECTRIC REGULATORS COST LESS ON THE LINE because you get continuing extra dividends . . . from **G-E RESEARCH** — superior regulating equipment: from **G-E DEPENDABILITY** —absolute minimum maintenance; in **G-E SERVICE**—routine or emergency. Result: Extra Values = **EXTRA PROFIT.**

Only General Electric returns so much for your regulator investment. Ask your G-E regulator representative to show you how. General Electric Company, Schenectady 5, New York. 423-37

Progress Is Our Most Important Product

GENERAL ELECTRIC

news



TV "booster" station atop Grizzly Peak relays signals to families in Boonville, Calif. The station converts VHF to UHF and beams the latter down into the valley. Twin Onan diesel generating plants supply normal and stand-by power

► Sierra Pacific Power Co. may issue up to $3,500,000 in unsecured promissory notes for periods not exceeding 12 months from the date of issue and, in any event, to have maturity dates not later than Dec. 31, 1960. The company expects to borrow the $3,500,000 during 1959 and 1960 and to use the proceeds to reimburse its treasury for construction expenditures already made and to carry out the construction program in progress and contemplated for 1959. Sierra Pacific estimated that its 1959 construction program will require about $3,975,200.

► The 1959 Rate Book, published under the direction of the Rate Research Committee of Edison Electric Institute, is available. Rates are those in effect as of April 1, 1959.

The rate book is a compilation of the residential, commercial, industrial and certain special-type rates for electric service furnished by investor-owned utility companies serving all communities of the United States having a population of 20,000 and over, as well as a number of smaller communities in states that would not be adequately represented under the 20,000 minimum. The price is $20 per copy to member companies and $30 to nonmembers.

Management

No Ban for Foreign Imports

The office of Civil and Defense Mobilization has rejected the request of the National Electrical Manufacturers Assn. and major U. S. electrical suppliers to ban imports on heavy electrical equipment. OCDM's director, Leo A. Hoegh, stated that a year's study of the question leads to the conclusion that the imports of heavy electrical equipment are not threatening to impair national security as claimed by the American companies.

Reading between the lines of the formal decision, government officials apparently do not believe that the imports of foreign generators, transformers and circuit breakers are large enough to have harmful effects on the over-all power systems of the U. S. at present. The door was left open, however, for future consideration of restrictions on the imports of one particular category, hydraulic turbines. On the other hand, foreign policy implications apparently weighed heavy in the ultimate decision. A decision on requests to restrict imports of steam turbogenerators is still pending.

City Buys Utility Lines

The city of Milton-Freewater, Ore., has concluded the legal procedures necessary in its acquisition of electric properties of Pacific Power & Light Co. in the city.

Officials of the city and the company appeared at the Umatilla County circuit court in Pendleton June 11 to complete the condemnation action and enter into the record an agreement amounting to $205,000 to cover payments to the company for the properties.

About 500 former accounts of the company will be transferred to the municipal service immediately.

Leslie A. Hicks retired as president of Hawaiian Electric on June 30, his 40th anniversary with the company. A formal dinner marked the event. In this earlier picture, he cuts cake built to the shape of the power plant that bears his name

EW

Utility Research Centralized

Organization of a research department to manage the technical and scientific investigations being carried forward by Pacific Power & Light Co. was announced recently by Paul B. McKee, chairman of the board. Dr. James B. Ward, who has been supervising use of PP&L's electronic computer for engineering analyses, has been designated to direct the work of the new department.

The power company official said the regrouping of the personnel now assigned to research work in the fields of electric-industry technology, power supply, fish conservation and industrial raw materials is a recognition of the growing significance of organized research programs.

In addition to projects handled by PP&L's specialists, he said, the company plans to intensify its development work in association with electric equipment manufacturers, other industries and agencies. The work also will utilize the laboratory facilities and brain power of colleges and independent research institutions.

Washington Water Power Cameraman John Keith gets ready to shoot a scene from WWP's new sound movie on the public power vs private power issue, "The Dam Story." Part of film was made at the site of the company's Noxon Rapids Dam, nearing completion on the Clark Fork River in western Montana

PUD Completes Study

Many interesting facts concerning Douglas County are included in an illustrated 60-page economic study released last month by the Douglas County Public Utility District. Grady Auvil, PUD president, said that the economic survey was intended to give information to financial, commercial and industrial concerns interested in locating or investing funds in Douglas County. The study, written by William T. Nordeen, PUD manager, has taken over a year to prepare.

Included in the survey are aerial photos and data on six typical industrial sites, information regarding United States Bureau of Reclamation irrigation projects and commercial and industrial possibilities for industry.

Cities and areas of the entire county are described in detail along with pictures of each area. Included is a compilation of types of business in each area along with the number of employees.

WWP Film Takes Frank Approach

A forthright presentation of the investor-owned company's position in the conflicting philosophies of private vs public ownership, Washington Water Power Co.'s motion picture, *The Dam Story*, is being released for employee and customer showing.

Believed to be the first privately produced film to deal so frankly with a major problem in customer understanding, the picture centers around a young worker and his family, confronted with the need to get ahead and at the same time preserve their independence. Since the locale is the construction site, many beautiful and dramatic shots of Noxon Rapids and Cabinet Gorge projects are presented.

Copies will be made available at production cost to other companies.

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Peace River Project Expands

Peace River Power Development Co. Ltd. has been joined by three major Canadian investment houses and a utility company, and its engineering and economic studies are progressing favorably, according to William C. Mainwaring, president of the company.

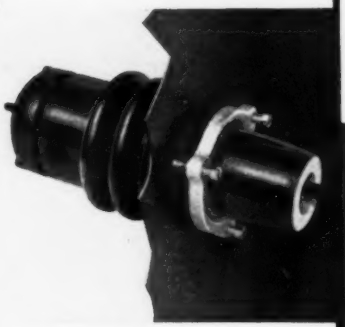
This brings to 13 the number of shareholding components of the company that plans to build the world's largest power dam on the Peace River near Hudson Hope.

Peace River Power Development project will cost between $200 million and $500 million. Crest of the main dam will be 500 ft above the river's surface and its length, bank to bank, will be 7,750 ft. It will re-

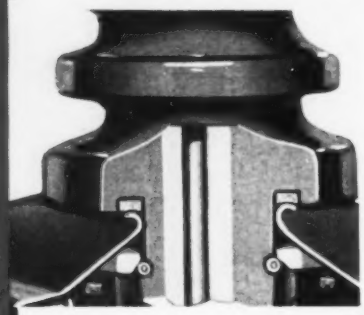
THESE SUPERIOR MOLONEY FEATURES ASSURE DEPENDABLE SERVICE

Moloney Distribution Transformers are available in both conventional and CSP types featuring the Moloney Core and a low impedance coil.

All bushings are made of high strength, wet-process, porcelain and are internally clamped using one piece Almag clamps. The high voltage bushings have a configuration design to obtain liberal creepage without excessive height and to assure high impact strength. Each gasket is made of reusable cork-neoprene and is retained.

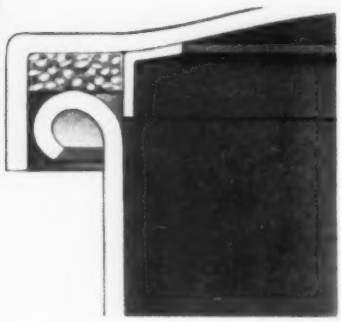


Sidewall bushings have the hardware keyed to the porcelain and the porcelain keyed to the tankwall, thereby preventing rotation of the bushing or any of its parts. Sidewall mounted high voltage bushings are equipped with a special cap for clamping the conductor in place quickly and safely without the use of tools.

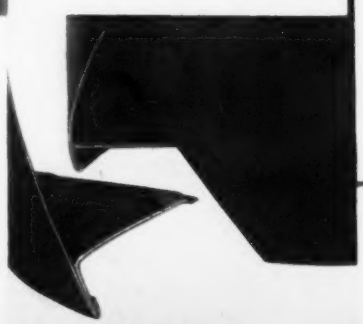


Cover mounted bushings are mounted on a smooth flange raised above the cover. This smooth rounded flange and the shape of the porcelain positively prevents the entrance of moisture. The contour of the flange eliminates corona at this point. Protective caps are provided for all cover mounted high voltage bushings.

Connectors are electro-tin coated and large enough to accommodate either the copper conductors specified by EEI-NEMA Standards or the ACSR equivalent. The large contact surface and a double-coil spring-type washer reduces conductor cold flow.



The tank and cover are die-formed assuring consistently accurate fit. The cover overhangs the tankwall and is dome shaped to shed moisture. The combination of a rolled top rim, cover overhang, cork-neoprene gasket and the gasket retainer positively seals the tank from moisture.



The base is welded to the tank wall. Then a sealing mastic is applied and the tank wall is rolled under the base flange to provide a triple thickness of metal. The tank and cover are painted by a hot-spray process and each coat is baked to form an extremely durable finish.

ME59-6

MANUFACTURERS OF TRANSFORMERS FOR UTILITIES, INDUSTRY, AND ELECTRONIC APPLICATIONS

Sales Offices In All Principal Cities

MOLONEY ELECTRIC COMPANY

ST. LOUIS 20, MO.
TORONTO, ONT., CANADA

tain enough water to produce 3,000,000 kw. PRPD Co. was established last year to provide power in the Rocky Mountain trench, where the Wenner-Gren B. C. Development Co. is planning an industrial empire.

Pension Funds Buy Utilities

Pension funds operated for state, county, city, district and school employees in California have 43% of their assets invested in public utility bonds and debentures, a survey by Pacific Gas and Electric Co. disclosed recently.

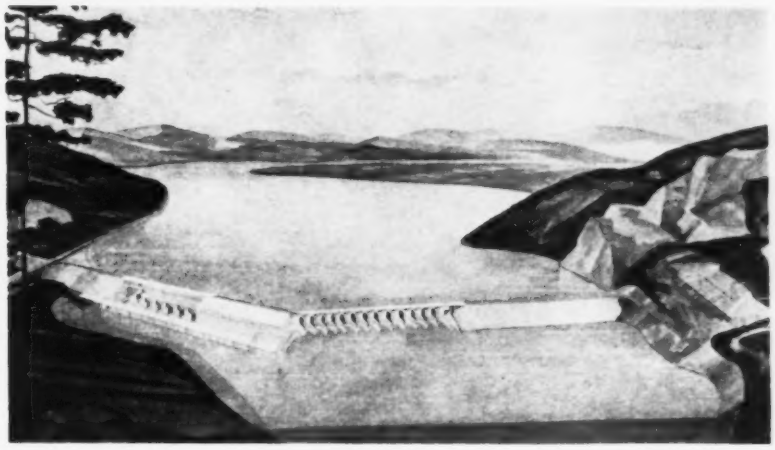
The funds have combined assets of almost $2.4 billion, an amount greater than the total resources of any but 10 of the nation's largest commercial banks. Of the more than $1 billion invested in public utilities, $156 million are invested in utilities operating in California and the PG and E portion represents $41 million.

PG and E undertook the survey, said its vice-president and treasurer, K. C. Christensen, as part of its continuing inquiry into the potential markets for its securities.

Benefits From Canadian Storage

Downstream benefits from controlling the Columbia River in British Columbia would be worth up to $40 million a year, according to Harry L. Purdy, BCE executive vice-president. Purdy said water storage dams in B. C. would increase tremendously the productivity of hydro power plants on the Columbia in the United States by releasing Canadian stored water during low-water periods. An extra 2,000,000 kw a year above the present production of 7,000,000 kw would be available. At "a wholesale kilowatt rate of $15 to $20, the potential benefit would be from $20 million to $40 million a year."

This drawing shows the general layout of Wanapum Dam which will be built on the Columbia River six miles downstream from Vantage, Wash., by the Public Utility District of Grant County. In the photo, from left to right: earth embankment and right bank fish ladder (the right and left banks of a river are determined while facing downstream); the 820 ft-long reinforced concrete spillway with 12 Tainter gates, the power house, left bank fish ladder and pump house, and left earth embankment



Artist's conception of the Wells hydroelectric project located on the Columbia River between Rocky Reach and Chief Joseph Dams to be built by the Douglas County Public Utility District. The $190 million project will have an initial capacity of 421,000 kw with six units. The Bechtel Corp. of San Francisco is continuing engineering investigation

Manufacturers—Distributors

Lab Equipment For Cal Tech

Westinghouse Electric Corp., through its Educational Foundation, has presented the California Institute of Technology with a sizable gift of engineering laboratory equipment.

C. Spence Purnell, South Pacific District manager, made the presentation at a ceremony in the office of Dr. Lee A. DuBridge, Cal Tech president.

The donation is part of a Westinghouse program to give some $500,000 worth of laboratory equipment to about 150 electrical engineering departments of colleges and universities throughout the United States.

► **Ernest Sadler** has retired as vice-president, engineering, of Kelman Electric & Mfg. Co., Los Angeles, after 32 years of service. He had

(Continued on Page 82)

Let's take a closer look at Demand Metering . . .

Why Call it Demand?

Does the word "demand" make you bristle?

While we all know that demand charges are fully justified from the standpoint of basic economics, the electric power customer often fails to realize that it is he who is making demands on the utility rather than the other way around. If psychology has a place in rate-making, should the word "demand" have ever been admitted to the electric utility vocabulary?

Today, when demand metering is being applied to the measurement of more and more residential loads, seems to be a good time to reconsider our use of the word. Electric customers, tabbed with a *demand* charge on their electric bills, have a tendency to bristle at the term.

If we remove *demand* from demand metering, it becomes a more acceptable concept . . . and if we substitute a logical and less offensive word in its place such as load, peak, or power, we have a more readily understood term.

What's your suggestion? We would like to hear from you. Address Glenn M. DeKraker, Sangamo Electric Company, Springfield, Illinois.

Acknowledged Leadership in Demand* Measurement

Sangamo offers the most complete line of demand measuring devices in the industry —equipment to indicate and record demands from the smallest values to the largest encountered by the electric power industry. The line includes singlephase and polyphase mechanical demand registers, thermal demand meters, indicating and graphic meters, digital demand recorders and translating systems for Kw, Kvar, and Kva demand. You can look to Sangamo for all types of demand devices.

*Until you change the term "demand".

JM59-3

SANGAMO ELECTRIC

Do you use THERMAL DEMAND?

The compact singlephase or polyphase Sangamo watthour and Lincoln demand meter combines the new features of Sangamo's watthour meters and Lincoln watt demand meters. These meters are calibrated at the factory to 1% of full scale.

Accuracy assured by carefully matched components that are completely shielded. Only two moving parts assure minimum maintenance.

Where future load growth is anticipated, capacity of the demand element can be doubled by changing two link connections and the demand scales.

. . . OR DO YOU PREFER

MECHANICAL DEMAND . . ?

Sangamo's new Type D mechanical demand register, when installed on any of the Sangamo extended range J2 and P2 watthour meters, gives the most accurate indicating demand measurement available. You get 1% full scale accuracy.

The heart of the demand register is the motor. With over two million Type H motors in service, it offers proven reliability in addition to higher torque, slower speed and higher insulation levels.

Universal and standard Type D registers were designed to give better disk visibility, better service accuracy, time interval indication, and simple disengagement of timing motor for register checking.

COMPANY, Springfield, Illinois

50TH ANNIVERSARY SANGAMO 1900 - 1950

For phone number of closest representative see advertising index in back of book.

CHANCE
K&T Fuse Links
can be used with any distribution cutout on the market

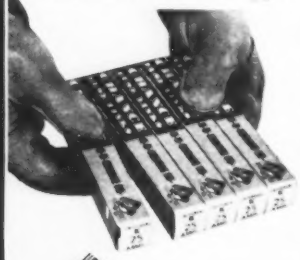
Quality control tests make certain that Chance Fuse Links meet standard requirements.

Precision-made to EEI-NEMA Interchangeability Standards

Chance K (fast) or T (slow) fuse links are available in three styles—Universal Buttonhead, Open-Link, and Universal style with removable buttonheads and cable adapters.

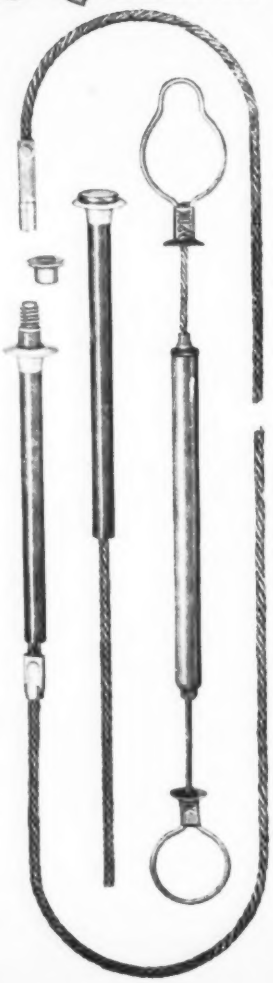
The fusible elements of these fast or slow fuse links have the consistent melting characteristics needed to give dependable performance in any distribution cutout at all values of fault current. Each individual strand of the copper cable leads is lead-coated for maximum resistance to corrosion.

Write for "Fuse Links and How to Use Them," a free manual on fuse link application and coordination.



Packaged for *EASY* removal

A slight twist separates a single link container from the 5 unit pack. Perforated end on single container allows link to be taken out easily — even with lineman's gloved hands. Type and rating are clearly marked on both ends of each box.



A.B.C. INDUSTRIES

A. B. CHANCE CO.

CENTRALIA, MISSOURI

CF59-18 A. B. Chance Co. of Canada, Ltd., Toronto

been with the company almost since its origin and was chief engineer until 1956 when Kelman became a subsidiary (now a division) of I-T-E. At that time he was appointed to the position of vice-president. Harold Mitchell, chief engineer, assumed his duties.

► **Grip-Tite** Mfg. Co. of Winterset, Iowa, has appointed **Western Power Products** Inc., 2765 N. W. Nicolai St., Portland, and 4949 Stanford, Seattle, as representative for its utility anchors. Territory includes Oregon, Washington, western Montana, northern Idaho and Alaska. **William L. Bright,** Western Power Products president and in charge of the Portland district, was formerly with Maydwell & Hartzell. Fred Baldwin, who heads the business in Seattle, was with A. B. Chance before he joined the firm. Western Power also represents Allis-Chalmers, Schwager-Wood and Schmitt Steel.

Bright

► L. M. Baxter Co., 1238 N. W. Glisan St., Portland, is representative for Ductless Hood Co. Inc., which manufactures ductless hoods for kitchens and other household uses and air purifiers for commercial and industrial plants. Working on the same principle as air purifiers used in atomic submarines, the products use activated charcoal to remove odors and impurities from the air.

► **Tri-State** Corp., 544 S. San Pedro St., Los Angeles, will represent **Aerovox** Corp., maker of a-c capacitors, for sales to original equipment manufacturers. Territory includes six Western states. Distributor sales will continue to be serviced by **Al J. Rissi,** 6919 Las Tunas Drive, San Gabriel, southern California; **Verne Linsley,** 2902 West Villa, Phoenix, Arizona; **Meyer & Ross,** 113 Tenth St., San Francisco, northern California and Nevada; **Ron Merritt** Co., 2601 First Ave., Seattle, Washington, Oregon, Idaho.

► **Sun-Tron** plans to distribute its electric heating baseboard and wall panels nationally. The line of aluminum and plastic panels, introduced in January, includes five models in a range of sizes and wattages.

► **Glenmart** Co., Los Angeles distributor for support equipment for the electrical industry, has moved into its new $350,000 warehouse at 2850 Tanager Ave. The new plant boasts 27,000 sq ft of floor space.

Among Glenmart's lines are Unistrut supports for conduits, cable and wire, and the Globe line of cable trays.

► **Bean Electric** Co., with head office in Seattle, recently purchased **Demmick Electric Supply** Co., Tacoma.

► **Don H. Burcham** Co., 510 N. W. 19th Ave., Portland, has added the **Lambda Pacific Engineering's** line of microwave and UHF translators.

► **J. E. Edstrom,** 1224 S. W. Morrison St., Portland, is new manufacturer's representative for the A. O. Smith Corp., Tipp City, Ohio, manufacturer of electric motors.

► **George R. Magnes** Co., manufacturers' representative, has moved to 44 Berry St. in San Francisco.

► **Federal Pacific Electric** Co. has announced that it will market under its own trade name all products of its wholly owned subsidiary, Roller-Smith Inc. F. H. Roby, FPE executive vice-president, said the electrical instrument and apparatus firm would continue its manufacturing operations under a new corporate name, **Fifty Avenue L** Inc.

► **Triangle Conduit & Cable** Co. has announced plans to enter the bituminized-fiber pipe and conduit field and will set up a new division for this operation at Landisville, N. J. The new division also will include plastic pipe.

► **Ted Palmer** has been named manager of S&C Electric Co.'s Western sales division, with responsibility for 10 states. Headquarters are at 1640 Rollins Road, Burlingame, Calif.

► Lighting Dynamics has appointed **Merwin Hooey** as sales engineer for its San Francisco office, 1485 Bayshore Blvd. His early experience in lighting was at Seattle and later he was regional sales manager for All-Brite.

► **Ray E. Adams** has joined the firm of Donald S. Gleason & Associates, representative for Prescolite, Virden and Lighting Dynamics. He is in the Seattle office of the firm, where he will work with **Don Gleason. Clyde Dodd** is in the Portland office.

Handle HOT jobs the SAFE way!

DON'T

use a steel fish tape and spend many dangerous hours snaking it through a conduit.

DO

use a Jet Line Gun and safely jet-propel a nylon line through the conduit in seconds!

NOTHING BEATS

THE Jet Line Gun

For SAFETY and SPEED!

The Jet Line System is SAFE!

- No powder charge
- No explosion
- Both nylon line and polyethylene rope are non-conductors.

The Jet Line System

SAVES WIRE!
SAVES MONEY!
SAVES TIME!

Invented by experienced electricians . . . in use by thousands of contractors!

Do away with danger!

There's no need to worry about hot panels when you use a Jet Line Gun . . . because the need for fish tape and snaking is eliminated!

A small jet-propelled cartridge does the trick! Launched by the Jet Line Gun, in seconds it twists around ells and bends, up and down as it lays a nylon line in the conduit . . . draw polyethylene rope through and you're ready to pull wire in minutes, not hours . . . *safely!*

Ask your distributor or write

Pat. Pending on Method and Apparatus

Jet Line Gun Company

730 Seigle Ave., Charlotte, N. C.

3759

Copyright 1958 Jet Line Gun Co.

Bud Edwards of Standard Electric Supply Co., Oakland, believes in bringing the customers to the products when it comes to selling tools. For the second year he has sponsored a tool show for electrical contractors, electricians and maintenance men, and it is showing signs of becoming an institution. About 27 manufacturers were represented, with 19 representatives on the scene to demonstrate the products. About 150 people attended. A buffet made it possible to linger longer, and a two-day trip for two people to Holiday Lodge was offered as a door prize

► Construction will begin immediately on a new $400,000 **warehouse in Los Angeles** for General Electric's **Construction Material Division.** Bigger than its present facility, the new warehouse is scheduled for occupancy by mid-October. The 52,756-sq-ft plant is being erected at one corner of a three-acre tract in anticipation of expansion, possibly within the next five years.

► **Stanley D. Reed,** Chicago field engineer for Line Material Industries, has been transferred to Portland. He replaces Robert L. Lemman as apparatus engineer.

► **Edward N. Gomberg** has been named general manager of **Con Diesel Western,** facility of Consolidated Diesel Electric Corp. The Western division is located at 15519 Lanark, Van Nuys, Calif.

► "A manufacturers' representative can't make his business pay out if he has only 5% lines." With this explanation **Roy Peck** of Roy Peck Associates, Arcadia, Calif., closed his doors and went out of business. Peck, who has been a distributor for southern California and Arizona for four years, said he quit manufacturers who had formerly allowed him 10% commission either cut this commission or decided to open their own offices in the area. Peck has been associated with the electrical industry since 1927.

► The McLoughlin Co., 811 E. 14th Place, Los Angeles, will represent Cavalier Corp., Electric Heating Division, in the southern California area.

► Adalet Mfg. Co. has appointed **Jack Payne Co.,** 1101 E. Fifth St., Los Angeles, as a representative.

► Western Lighting Corp. has made new appointments in the West. They include: **Dan Radke,** San Francisco; **Tom R. Van Wagoner,** Salt Lake City; **Norman F. Ross,** Phoenix; **Earl Stearns,** Tacoma; **Harry L. Stearns,** Portland; **Ross Vieths,** Seattle.

► Burndy has acquired exclusive sales rights to the **Thermoweld process** for welding copper electrical connections without external power or heat. Sales will be handled through local representatives.

► Sues, Young & Brown, Los Angeles, is back in the automobile air conditioning business as a result of the purchase of **Vornado** by the **Jamos Corp.,** Flushing, N. Y. A spokesman for SY&B says the firm will "definitely continue as a distributor for Vornado."

► **Graybar Electric,** Los Angeles, is distributing Webcor tape recorders, stereophonic equipment and record players.

► **Hassco Inc.,** Denver appliance distributor, has been appointed distributor for Hoffman television, stereophonic high fidelity and radio lines in Colorado, southeastern Wyoming and western Nebraska.

► **E. K. "Buck" Rogers** is now Packard Bell's Northwest district sales manager, with responsibility for six states. His headquarters are at 1152 Thomas St., Seattle.

► On the basis of **Emerson-Pryne** Co.'s promotion of a new combination heating and lighting unit ca-

Randolph Engineering Corp. moved into its new El Monte office and warehouse on June 1; held Open House on June 12 and 13. With the invitation to visit the new quarters came the announcement by H. J. Randolph of the appointment of Ray W. Morgan to his staff. Morgan formerly was with G-E and G-E Supply, handling apparatus

NEW! PLUG-IN ROLLER PLUNGER LIMIT SWITCH WITH Exclusive MICROMETER ADJUSTMENT

This new Square D roller-plunger plug-in limit switch is built for rugged machine tool applications—designed for cam-type operation and not restricted to direct, in-line approach of the actuator. Uses same field-proven precision switch mechanism as roller-arm type for long reliable operation. Moreover, it provides these important features:

Micrometer adjustment for fine adjustment of the roller after the switch has been mounted and wired. 1/8" movement of the roller plunger eliminates expensive cam shimming and adjustment.

Operating direction can be changed 90° for added flexibility. Roller plunger can be set either parallel or perpendicular to the base. No tools required.

Cam-type operation is possible because of the construction of the plunger assembly.

Oil-tight construction for all machine tool applications.

Plug-in construction · Switch plugs in—in seconds.

Easy wiring because all wiring can be done without removing from box.

Reversible plug-in unit can be positioned with roller plunger at either top or bottom.

Write for Bulletin 9007 AW. Address Square D Company,
4335 Valley Boulevard, Los Angeles 32, California

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

For phone number of closest representative see advertising index in back of book.

BRONCO
Certified
66
NEOPRENE
has the HIGHEST NEOPRENE content in the industry
The protecting outer jacket on Bronco 66 Certified contains 67.32% Neoprene—highest in the industry! This is why your Bronco 66 cables last longer, have greater resistance to oil, ozone, sunlight, heat, flame, chemicals, and abrasion.
BRONCO TAKES THE GUESSWORK OUT OF CABLE BUYING
How do you know your type SO cord or type W, G & Control cable is the best that can be had?
Look For These Two Symbols of Certainty:
1. Branding—"Bronco 66 Certified—67.32% Neoprene" is molded* into the jacket at two-foot intervals.
2. Each carton and reel carries a registered certification as to jacket contents signed by a professional engineer. When you find these guideposts, then you will know that you have the best.
*U.S. PATENT #2867001
BRONCO CERTIFIED
WESTERN INSULATED WIRE CO.

pable of using one to three heat lamps as a "people heater," W. H. Kress Co. immediately placed it in two motels under construction in the Portland area. The two jobs include 80 units for bathrooms.

► Directors of **Fostoria Pressed Steel** Corp., **Chempump** Corp. and **Zenith Engineering** Corp. have approved a merger proposal. The combined company would be known as Fostoria Corp.

► **Clark Baker Jr.,** formerly with Capitol Wholesale Electric Co., is now with Smoot-Holman Co., still in Sacramento.

► **Leonard R. Wren** has been appointed sales engineer in the new Seattle sales area for White-Rodgers Co., St. Louis manufacturer of air conditioning, heating and refrigeration controls.

► Kimball Distributing Co. of Salt Lake City has opened a branch in Phoenix. This first out of town operation will be managed by **Harold E. Aste.**

► **Robert J. Mullenbach,** executive vice-president in charge of Electric Machinery Mfg. Co.'s Mullenbach Division, Los Angeles, has been transferred to the position of staff consultant. His brother, **Charles F. Mullenbach,** has been retained in a similar post. Also announced is the appointment of **Wayne M. Bitting** as general manager of the electrical equipment department and **Robert E. Cline** to a similar post in the electronics department of the Mullenbach Division.

► **R. D. Hitchner** has been appointed vice-president and general manager of Globe Electrical Mfg. Co., Gardena, Calif. In his new administrative capacity Hitchner will be in charge of all Globe plant operations. Replacing him as plant manager is **Armand Berges.**

► **William R. Dunn** has been appointed sales representative for northern California and part of Nevada by Feedrail Corp. He will headquarter in San Francisco.

► **Ken Wilkinson** has been appointed Pacific District sales manager of the Lighting Products Division, Sylvania Electric (Canada) Ltd. He succeeds **A. McIntosh,** who is taking up the post of Central District sales manager. Wilkinson will make his headquarters in Vancouver.

3760
Cover only with gasket
3761
Cover with #S 365 Parallel Slot Receptacle
3762
Cover with #S 368 "T" Slot Receptacle
3763
Cover with #S 321 "U" Ground Receptacle
3768 L
Cover with #4041 L 20 Amp. SP Lock Switch
3769 L
Cover with #4043 L 20 Amp. 3 Way Lock Switch
3766
Cover with #4200 10 Amp. "T" Rated SP Switch
3767
Cover with #4230 10 Amp. "T" Rated 3 Way Switch
3768
Cover with #4041 20 Amp. SP Switch
3769
Cover with #4043 20 Amp. 3 Way Switch
3765
Cover with #S 396 20 Amp. 3 Wire Receptacle
3770
Cover only with Gasket
3771
Cover with #S 365 Parallel Slot Receptacle
3772
Cover with #S 368 T Slot Receptacle
3773
Cover with #S 321 "U" Ground Receptacle
3775
Cover with #S 396+ 20 Amp. 3 Wire Receptacle
3780
Cover only with Gasket
3781
Cover with #800 Parallel Slot Receptacle
3782
Cover with #300 "T" Slot Receptacle
3783
Cover with #3200 "U" Ground Receptacle
SLATER
3784
Cover with #3270 "U" Ground Tandem Receptacle
3785
Cover with #480 SP Switch & "T" Slot Receptacle
3786
Cover with #482/2 SP Switches
3787
Cover with SP Switch & "U" Grd. Rec

FLIPS OPEN... FLIPS CLOSED!

FLIPS CLOSED... FLIPS OPEN!

- **Solid Thick Non-Corrosive Aluminum**
- **Meets R.E.A. and Federal Specifications**
- **Simple, Positive, Fool-proof Action • Easy to Install**
- **Takes Any Type Standard Switches and Receptacles**

Special Stainless Steel Spring

Slater Flip Lid*

SLATER MEANS BU$INE$$

SLATER ELECTRIC & MFG. CO., INC., GLEN COVE, LONG ISLAND, NEW YORK • ORiole 6-1100

Architects:** Use this as a handy specification guide* ***Contractors and Wholesalers:** Use as ordering guide* ****Pats Pending

Reserve Your Copy of the New 1960 Catalog Now.

State whether Electrical Contractor, Wholesaler or other.
Address request to Slater, 47 Sea Cliff Ave.. Glen Cove, N. Y.

When you consider expansion... the most important investment you can make is in the creative ability of men.

FLUOR

Engineers and Constructors

Design in three dimensions

At Fluor's Los Angeles headquarters, there is an 8,000-square-foot building where 30 plant designers work with 20 professional modelmakers. Drafting tables are within 10 feet of model assembly tables. Another building contains an elaborate photographic studio where precisely scaled isometric and plan views can be taken under shadowless lighting.

All this began seven years ago when Fluor engineers built a scale model and rigged miniature hoists to solve a difficult erection problem. Success of this trial led to experiments with the use of models as a basic design tool. Cost studies showed substantial savings in drafting man-hours (net savings, above modelmaking costs.)

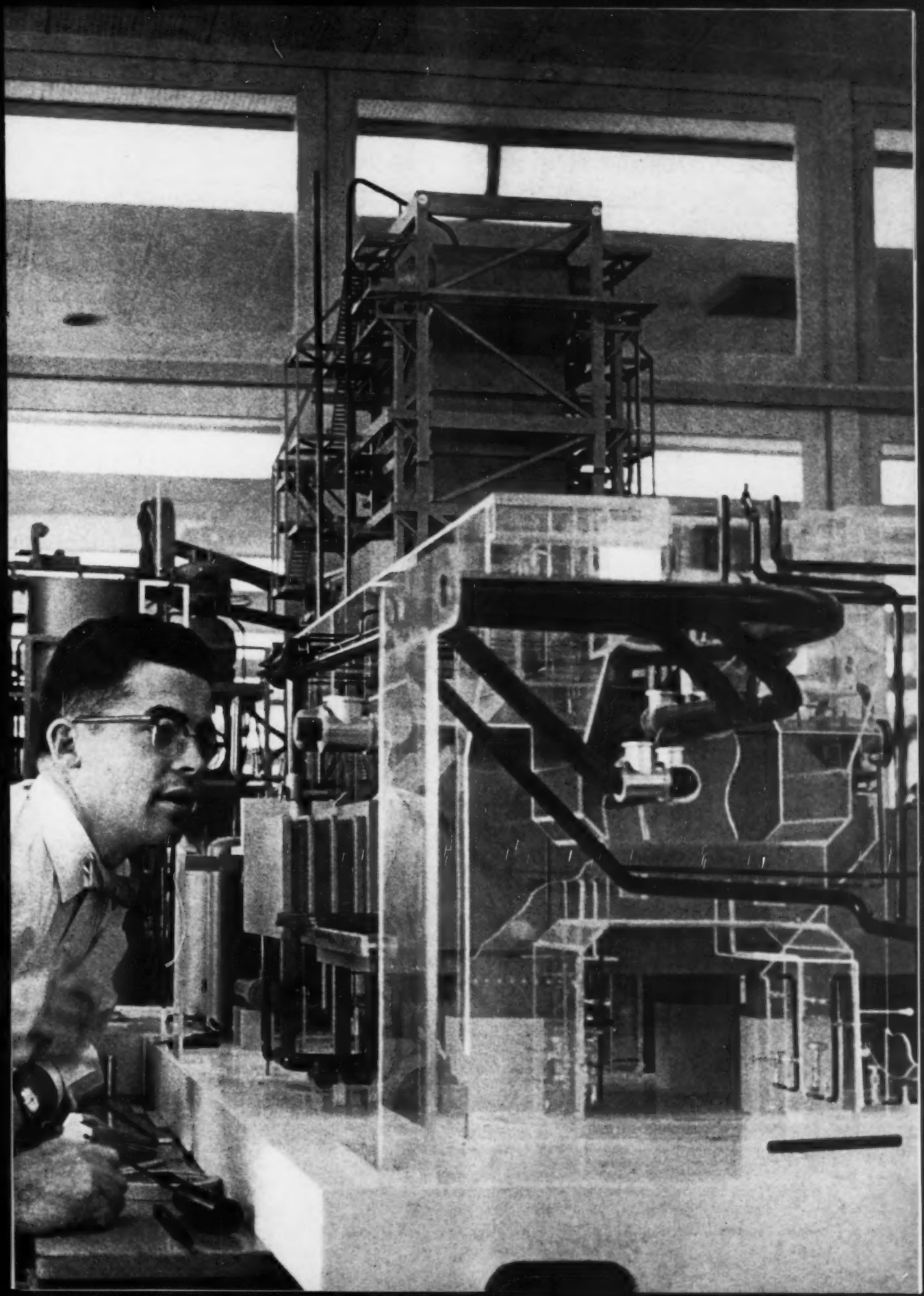
Today, models are to be found in most of Fluor's drafting rooms, and nearly all Fluor-built plants are designed with the aid of this tool. Beyond the dollar savings there are many less tangible benefits. Sizable groups can confer over a model, reach quick agreement on layouts, approve or revise many details at a single session.

Piping runs are shorter and more direct, valves and instruments are more accessible when designers lay them out on a model (a Fluor comparison study of a refinery design showed a $50,000 saving in pipe, fittings and fabrication by use of a model vs. conventional layout drawings.)

Costly revisions are minimized when many specialists can study a complete plant in miniature before construction begins. In the field, models serve as a reference for construction crews and a guide for operator training.

Unless scale models are properly used—as a basic, integrated design tool—most of these advantages are lost. The development and refinement by Fluor of design techniques using scale models has been a creative contribution to the engineering and construction industry.

For more information on the use of scale models in design and construction, write to Dept. 64. The Fluor Corporation, Ltd., 2500 South Atlantic Boulevard, Los Angeles 22, California.



ARE YOUR HOT STICKS SAFE?

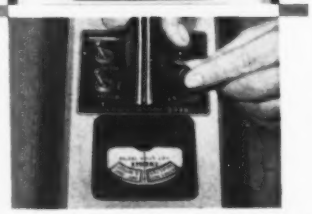
Chance Portable Hot Stick Tester takes the guesswork out of this important question

Here's a simple, inexpensive way to test hot line tools—to come up with a positive answer to the often difficult question—"Is this stick safe to use?"

The Chance LT-10 Hot Stick Tester can test poles up to 3" in diameter. It is safe to use—operating voltage 110 to 125 v., 60 cycle A. C. Transistorized—no tubes to replace. It clearly indicates excessive leakage current through the sticks due to absorbed moisture. Ask your Chance Representative for a demonstration.

EASY TO OPERATE. A simple single dial shows whether the tool is safe to use or whether the tool should be dried and re-tested. A number of readings along the pole test every foot for safety.

EASY TO CALIBRATE. You can always be sure that the tester is accurately calibrated. Just press the "PUSH TO CALIBRATE" button and turn "ADJUST" knob until needle is centered on dial. A calibration standard is furnished with the unit for positive double-checking.



ABC Industrial Products

A. B. CHANCE CO.

CENTRALIA, MISSOURI

CH59-16 A. B. Chance Co. of Canada, Ltd., Toronto

For phone number of closest representative see advertising index in back of book.

Market Development

Retired for Sure

Bill Tate, Portland General Electric Co., gets in some good sledge hammer swings on outmoded ranges and water heaters as a part of the utility's Centennial Trade-in Jubilee. During the campaign, customers were offered a $40 bonus trade-in on the purchase of a water heater replacing a fuel-fired unit and $20 on a range replacing old equipment. Tait expected to go to work on about 1,000 obsolete ranges and 500 water heaters

Utilization Course Is Broadened

Success of the electric supply utilization course conducted by the NAED in Los Angeles has led the national headquarters to embark on a program of instituting similar educational classes in about 30 areas throughout the nation. Courses are already scheduled to begin in the fall in Minneapolis and in New Jersey.

In Los Angeles this course to teach beginners in electrical wholesaling about material is winding up its second year. The class boasted the largest evening enrollment of any offered at the Los Angeles Trade Technical Junior College. Bernie Mason of Westinghouse Electric Corp. was the instructor.

Although plans for next year have not yet been firmed the education committee of the Southern Area of NAED's Pacific Zone is working on the promise of offering an advanced course instead of repeating with another elementary course. Among the

possibilities for the next term are classes in blueprint reading, motor control, transformers and panel boards, supplementing these lectures and demonstrations with plant visits.

Edison Wins Four PUAA Awards

Southern California Edison walked off with four awards at the Public Utilities Advertising Assn. convention in Dallas.

Edison's advertising campaign in connection with the Medallion Home program was considered best of all the campaigns conducted by a major utility. The company also captured a first-place award for its 25-minute color and sound documentary movie, *Edison Highlights of* 1958, which was a diary of the year's events that portrayed its construction and helicopter operations.

Consumer and dealer booklets describing Edison's Medallion Home program took second prizes in their respective categories.

X-Ray Home Shows Wiring Needs

A two-month Medallion Home promotion was previewed June 5 when California Electric Power Co. and General Electric unveiled an X-ray all-electric home in Apple Valley, Calif.

Built by Gibbs Construction Co. of Apple Valley, the Golden Horizon home will be displayed to demonstrate optimal wiring in a house. A special tape that shows up only under black light traces the circuits and provides for a dramatic presentation.

After the promotional showing, the X-ray home will be on sale.

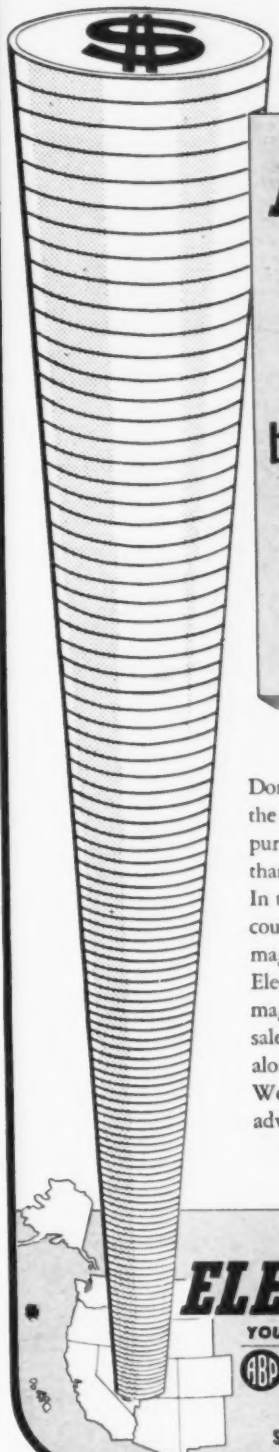
► Construction has begun on Southern California Edison's new $250,000 **district commercial office in Ventura** with completion scheduled for early 1960. The 10,626-sq-ft office will feature an auditorium especially designed to permit demonstrations of electrical appliances by home economists.

► Hawaiian Electric Co. with the Hawaii Times and the Home Builders Assn. sponsored a **"Nippon Cho" Gold Medallion Home Show** during the last week of May. Featured were four model homes in Japanese motif with four Honolulu contractors and associated supply houses participating.

You need the complete coverage of

ELECTRICAL WEST

to sell the billion-dollar-a-year western electrical industry properly



Don't bank on your advertising back East to cover the people out West who decide and influence the purchase of more electrical equipment and supplies than are bought in any other section of the country. In the utilities field alone, twice as many "men who count" read Electrical West than read any other magazine. In fact, 50% of the utility readers of Electrical West do not read a national electrical magazine. Consulting engineers, contractors, wholesalers, industrial electricians and engineers go right along with this western preference for Electrical West and buy most from the manufacturers who advertise in it.

IF YOU ARE NOT ADVERTISING IN

ELECTRICAL WEST

YOU ARE NOT SELLING HARD ENOUGH IN THE WEST

68 Post St., San Francisco 4, California

A McGRAW-HILL PUBLICATION

Spokesman of the Electrical Industry of the West for 72 Years

New Line

Clay W. Hixon and H. T. Ward of F. B. Connelly's Seattle office look over Hamilton equipment during a recent visit to the manufacturer's Two Rivers, Wis., plant. V. F. Peterson and D. C. McDermand explain workings. Connelly recently took on the line

Meet or Beat Us, Say Home Builders

Associations all over the United States are being challenged by the Longview-Kelso (Wash.) Home Builders Assn. to "meet or beat" its 1959 Medallion Home record.

In issuing the challenge, Earl Hurlburt, president of the local association, said his group is confident it will get a higher percentage of Medallions in relation to total number of residences built than any other group.

Plans for the competition were laid at a meeting with Cowlitz County PUD officials and Robert K. Gilbert, Portland Live Better Electrically representative.

More than 90% of homes built so far this year have met Medallion specifications. This is 92 homes, a six-month record that compares with 73 electric homes built during 1958. The PUD started its Medallion campaign in March 1958.

► **Winter Market dates** for 1960 have been announced by the Western Merchandise Mart and the Los Angeles Home Furnishings Mart. The Los Angeles Market will open Sunday, Jan. 10, and run through Jan. 15. The San Francisco Market will follow, from Jan. 18 through Jan. 22.

Horrom Gets New Post At Montana Power

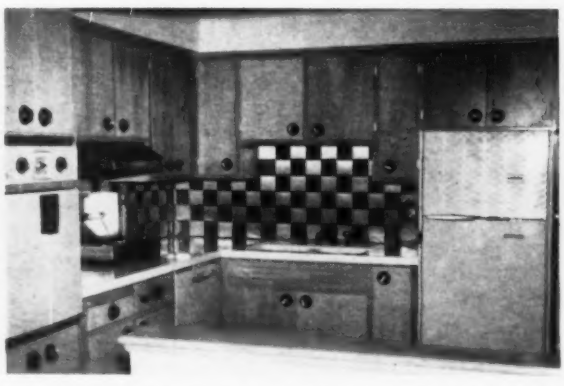
O. J. Horrom of Butte has been appointed assistant general sales manager of the Montana Power Co., J. E. Corette, president and general manager, announced June 9. In his new post, Horrom will assist D. J. McGonigle, general sales manager.

An employee of Montana Power in Butte since Sept. 19, 1931, Horrom has been commercial sales supervisor since 1953. Prior to that time, he was senior service adviser for two years.

Horrom was graduated from the Missouri School of Mines at Rolla in 1925 with a bachelor of science degree in electrical engineering. Upon graduation, he joined the staff of Public Service Co. of Colorado and was with that firm continuously until he became affiliated with Montana Power in 1931.

► Tourists making Seattle **City Light's Skagit tour** this year will be riding in a new sightseeing boat. Supt. Paul J. Raver announced that the Alice Ross II, as the boat has been christened, has been completed and is ready for use. The tours will be continued on the same basis as in 1958. There will be two guided tours daily, seven days a week, from Saturday, June 13, through Monday, Sept. 7. More than 10,000 tourists made the trip last year.

► Roger Cochran Co., appliance distribution firm, has been established in Spokane, Wash., by **Roger Cochran**, owner-manager. The firm will handle Speed Queen and Quicfrez lines.



First Medallion apartment in the Denver area was promoted by Colorado Central Power Co. The 23-unit apartment is the first of six to be constructed by Paul Farr, builder-owner. Left—Farr receives his Medallion certificate from Herb Williams, power sales engineer of Colorado Central Power. Above, a typical all-electric kitchen in the Prince Charles apartments

Heat Pump Show in Portland

Fifteen manufacturers displayed their products in Portland General Electric Co.'s second annual Air Conditioning and Heat Pump Show May 15 and 16. The show was held at PGE's modern service center. Since it was the day before NELPA's Business Development Conference in Portland, delegates were given special invitations to attend.

Sound films and slide-illustrated talks showing heat pump and air conditioning applications were shown at intervals through both days of the show.

Ten heat pump installations in restaurants and business houses in the PGE service area were suggested as extra inspections for show visitors.

Clara Sherburne, Hotpoint, left above, tells the home laundry story with the aid of cutouts, while Beverley Lyons, California Oregon Power Co., and Luci LaFontaine, Calgon, watch. These three visitors in Portland spoke to the Oregon Chapter, Electrical Women's Round Table, at a dinner in PP&L's new demonstration kitchen. At left are three Oregon Chapter officers: Charlotte Dodson, free lance; Grace Phipps, PP&L, chairman; Lucille Thorson, singer, outgoing chairman

► Operations at **Cannon Electric** Co.'s Phoenix Sky Harbor Airport plant won't begin Sept. 1 as originally planned. A spokesman for the firm, which has home offices in Los Angeles, said target date for completion of the plant has been "moved past the original date." He added that an increase in orders requiring fast delivery has slowed down the firm's plans to move one of its divisions to Phoenix from Los Angeles by September.

► For its eye-catching advertising promotion in connection with Electrical Tuesday and, in color, Electro-Day, the **Montana Power** Co. has been awarded a certificate of merit by the Newspaper Advertising Executives Assn. Inc. Word of the award was received in Butte recently by D. J. McGonigle, general sales manager for the power company.

► San Luis Valley Electric Assn. of Monte Vista, Colo., received the Westinghouse award for outstanding utility light bulb promotion during 1958. **Harold Brandt** of Westinghouse presented the trophy to **Ronald Wadleigh**, utility power advisor.

Frank Ballman (at mike), Thermador vice-president in charge of sales, was elected president of the Los Angeles Electric League. Other officers are from left: Stanley Everett, treasurer; Floyd Lovelace, secretary; Bob Leonard, executive vice-president; Samuel Robbins, general counsel; Glen Logan, vice-president and managing director

Hospital Goes On PGE Lines

When Portland's 300-bed Providence Hospital was built in 1942, two generators were installed along with its steam boiler to provide full electric service.

Since then the annual patient load has grown from 5,000 to 30,000 and the load for both steam heat and steam power became so great that the hospital had no stand-by reserve power. So decision was made to put the hospital on Portland General Electric Co. service, retire one of the engines and retain the other for stand-by. PGE now provides service with two 11,000-v lines.

Del Brown, PGE testing department superintendent, and Roy Tucker, chief engineer for the hospital, worked out details of the switchover.

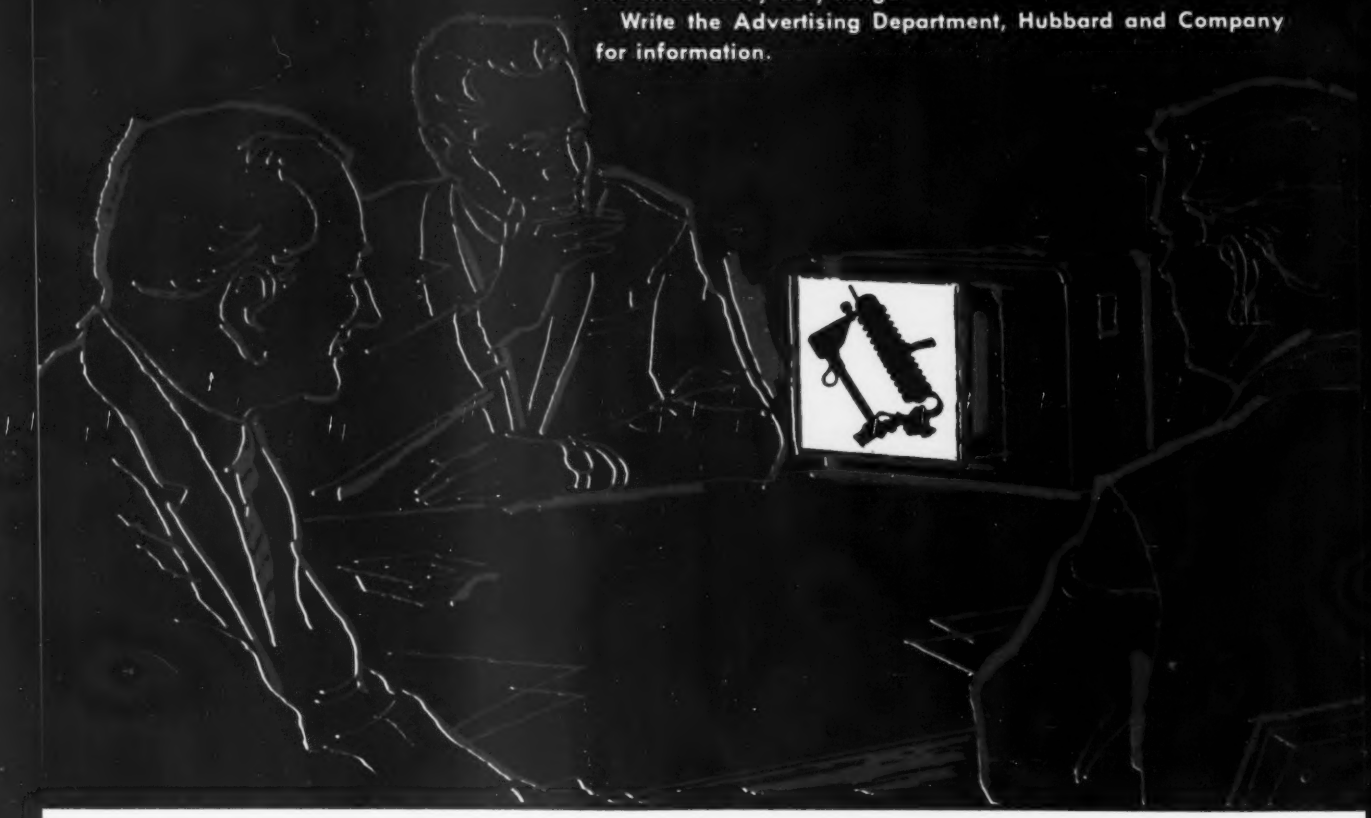
SEE AND HEAR
the dramatic story of
SINGLE-VENT SMALL-BORE
CUTOUT OPERATION

See the new 16mm sound and color movie "The Hubbard EHD Faultmaster" right from your own desk chair. Film time: ten minutes.

Watch the Hubbard EHD Cutout clear faults throughout the range without "null operating points"—see closure on a fault, dramatizing conclusively the *positive protection* and *safe operation* provided by the Single-Vent Small-Bore fuse cutout.

Through the use of ultra slow-motion photography, you see the fuse link melt right before your eyes...you see gases generated within the fuse tube and discharged downward and away in a single confined cone—eliminating the possibility of damage to overhead construction. You see the results of research leading to the industry's first Single-Vent Small-Bore Cutout in the extra heavy duty range.

Write the Advertising Department, Hubbard and Company for information.



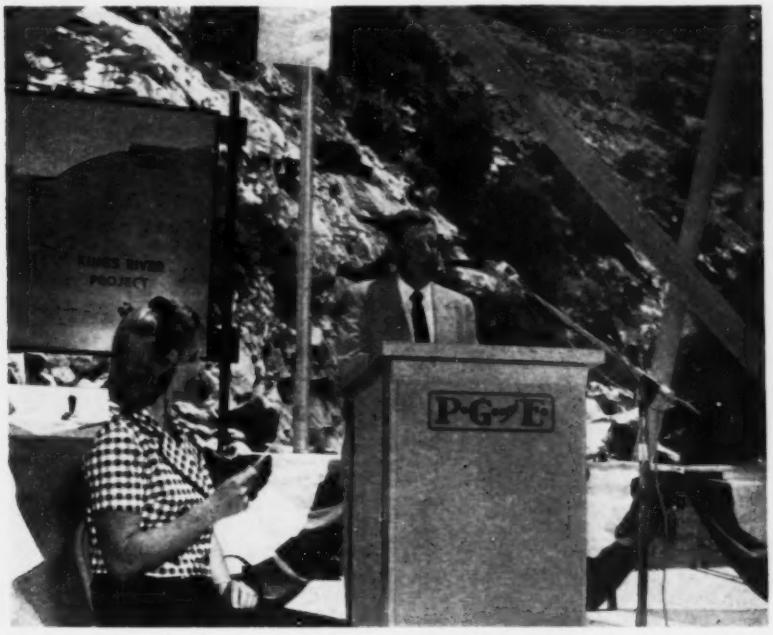
No screen is needed, no threading, no rewind, no darkened room. Just plug it in and watch. Filmed at the Hubbard Electrical Research and Development Laboratory.

HUBBARD

AND COMPANY • 1250 45TH STREET • OAKLAND 8, CALIFORNIA

For phone number of closest representative see advertising index in back of book.

Growth



PG and E President Sutherland talks at Kings River project dedication ceremonies

Kings River Dedicated

Pacific Gas and Electric Co. in dedicating its $80 million Kings River hydroelectric project (ELECTRICAL WEST, March 1959, p 70) paid tribute to the enterprising western pioneers whose vision made possible the 260,000-kw stairway of power.

PG and E President Norman Sutherland paid tribute to the co-users of the water resource, the farmers who had invested $70 million in irrigation works. These developments, power and water, are key ingredients to the prosperity of the valley.

Kings River power house, the last development on the river, will be under way this fall adding 42,000 kw to the project.

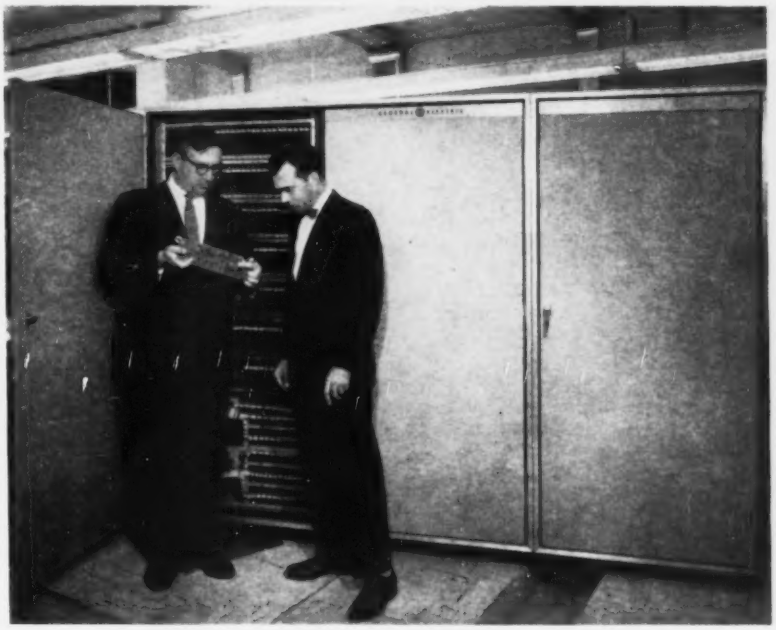
Turn Costs for Boundary

Seattle City Light officials have okayed a new plan for construction of the boundary site on the Pend Oreille River.

Original plan called for a thin arch concrete dam with the power house downstream from the dam on the right bank of the river. Diversion was to be through large tunnels drilled through cliffs around the left of the dam. In the alternate plan, an ancient river channel on the left side of the river would be excavated for use as a spillway. The material taken out of the channel would be placed in the river to form a rock-fill dam with an impervious central core. The power house would be a giant underground chamber mined out of the cliff on the left bank. The alternate plan makes possible savings of 15% to 20%, which will reduce the cost estimates from $83 to $70 million.

City Light has also approved a plan placing overhead facilities underground in an area between the central business district and the site of the Century 21 Exposition. The project will involve $750,000 for electrical equipment and $185,000 for underground conduits, manholes and vaults. The project is aimed at improvement of the approaches to the exposition site for Seattle's 1961 "World's Fair."

► Merritt, Chapman & Scott Corp. of New York City was low of 14 bidders with an offer of $23,985,564 for construction of Cougar Dam on the south fork of the McKenzie River. Completion date is set for March 1, 1963.



G-E's Arnold Spielberg and Henry Bluhm with power plant automatic controls

Automatic Plant

Southern California Edison has announced that its Huntington Beach units No. 3 and No. 4 will be automatically controlled. To accomplish the control functions Edison has ordered a GE-312 digital control computer. The computer will automatically carry out the following programs: cold startup; hot startup; normal shutdown; emergency shutdown.

Control during normal operation.

In addition the computers will direct scanning alarm and data logging functions.

Association Affairs

Glenn Ward of San Leandro shows the difference between listed and unlisted materials

Education Method

"Oops! Did I pass these—or these?" On a display board with such a label Glenn Ward, San Leandro electrical inspector, illustrated the difference between materials. They were wiring materials that look alike. One group was of those not listed by Underwriters' Laboratories while the other was. Differences in their construction and quality that inspectors should look for in field inspection were pointed out.

This feature was one of the new educational methods used by the Northern California Chapter, International Association of Electrical Inspectors, and shown to the joint meeting of that chapter, the Sacramento Valley Chapter and the Central California Chapter at Monterey May 16. Ernest Nelson, chief inspector, San Leandro, chapter chairman, presided. The Central California Chapter was represented by Clyde Smith, Fresno inspector, secretary of that chapter, and Anthony Nastro, Sacramento, secretary of the Sacramento Valley Chapter.

Major topic of discussion at the morning session was a revised edition of Assembly Bill 1358 to provide for professional status of inspectors in the building, electrical and plumbing fields. Robert Riisom, Sacramento County electrical inspector, discussed the changes made to make the bill more acceptable following previous criticisms. The group itself took no action but members were told that if they favored the bill they should contact their members of the state legislature. A hearing was to be held upon it May 19.

Creighton Schwan, chairman of a grounding committee, presented a resolution resulting from meetings with plumbing and utility representatives in regard to the use of metallic underground water piping systems for service grounding. The resolution requested that the uniform plumbing code make it mandatory that the metal used for the water piping system for any premises and the metal used for the supply piping to the system be of the same material to minimize electrolysis.

Leon Guibara, Kaiser Aluminum & Chemical Corp., made a presentation on the characteristics of the newer aluminum cables and conduits.

After hearing of the plans for code discussions at the Southwestern Section annual meeting at Santa Rosa, Aug. 31-Sept. 2, from Secretary-Treasurer Lou La Fehr and President Chester Hefner, E. E. Carlton, California Division of Industrial Safety and IAEI council member, warned that proposals for any change in the National Electrical Code must be prepared in writing with supporting evidence. Of the 11 items passed upon at the last annual meeting he said none were in such form that they could be presented and hence were impotent. He also said that the last chance for proposals for code changes through the association would be in December of this year under the schedule set up for changes in the 1962 code.

Inspectors Election

Electrical Inspectors Association of B. C. elected **Douglas C. Cornborough,** B. C. electrical energy inspector, as its president; **Frank Holden,** West Vancouver inspector, vice-president; **Jack R. Dooley,** Electrical Service League of B. C., secretary; **James R. Walker,** senior electrical designer, Inspection Division, Province of B. C., treasurer. The election was held at the annual general meeting in Burnaby at which **J. R. Walker** presided. One of the major topics of the convention was circuit loading and demand factors in various types of occupancies based upon experience rather than the old code theories. Wiring methods, a Canadian code workshop and similar topics made it a full technical program.

► **Magda Michael,** new executive secretary of the Los Angeles Electric Club, comes well equipped to cope with the eccentricities of the members, having been secretary to W. C. Fields for 12 years. She was formerly with American Blower Co. She replaces Marion Bacot, for the past six years secretary of the club, who married member Al Edmonds, General Electric Co. distributor specialist.

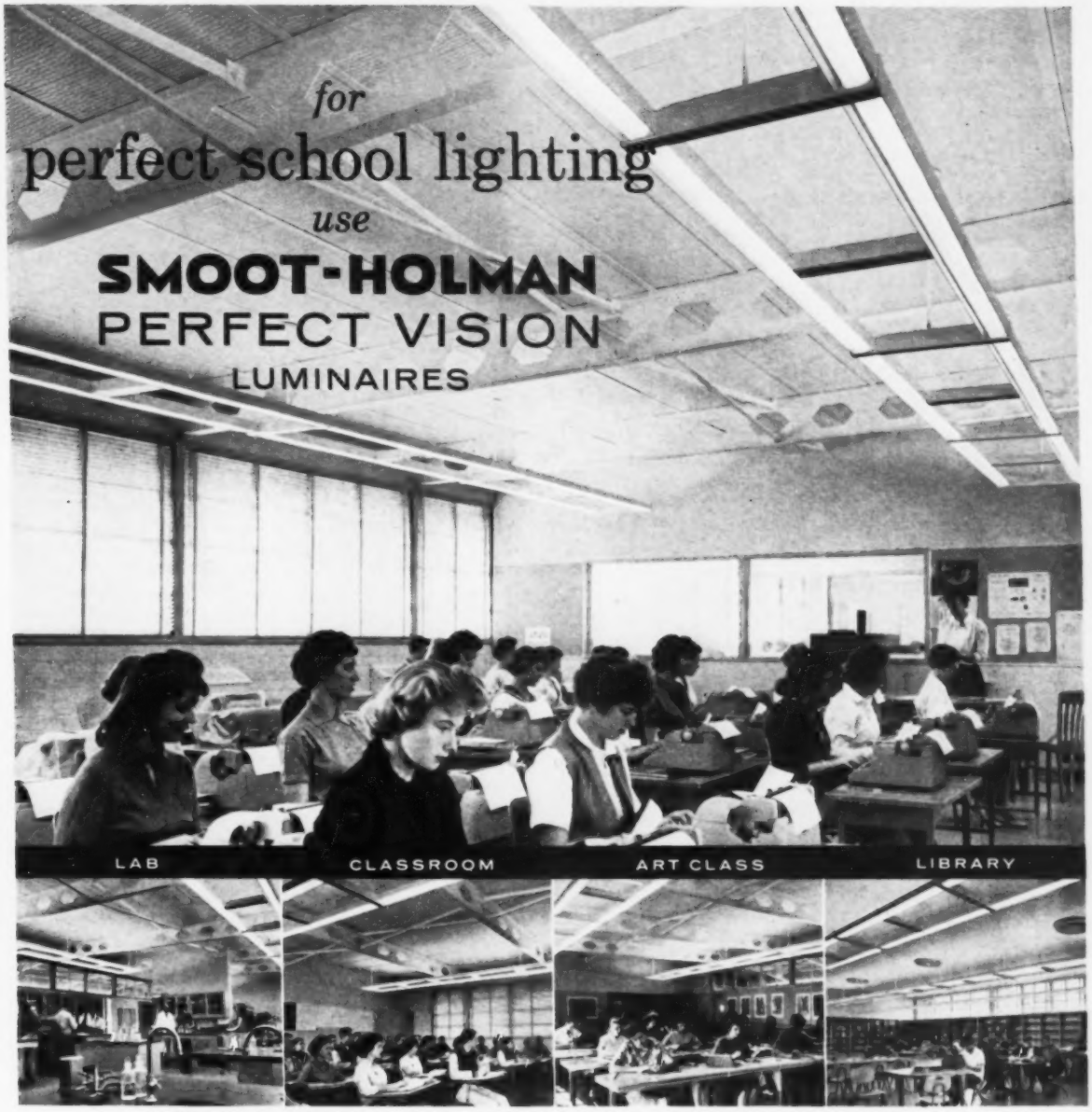
► **Electrical Maintenance Engineers' Assn.** of the Columbia Basin elected Fred Bunnell of McCulloch & Sons, Portland, as its new president. John Pingel, Oregon Steel Mills, is vice president and James Fisher, Portland General Electric Co., secretary-treasurer. The association at its May 28 meeting visited the General Electric Co. service shop where C. L. Roberts, manager, spoke upon epoxy resins and their applications to electrical equipment.

► **The Electrical Contractors Assn. of British Columbia** will hold its annual convention in Kamloops on July 23-25, J. R. Dooley, secretary-treasurer, announced.

IES

Optometrists and illuminating engineers joined in a combined society meeting at the Elks Club, San Francisco, May 20 under a general program title of "Quality Factors in Lighting for Seeing" with emphasis on glare, contrasts and color. Walter G. Bayha, consulting engineer, moderated a panel consisting of Dr. Arthur C. Heinsen Jr. and Dr. Charles J. McDonald, both of whom were past presidents of optometric societies. Speaking for the illuminating engineers were Marcel Vogel, research director in lighting for IBM, San Jose, and Prof. Dan M. Finch, University of California.

As an added feature the Owens-Corning Fiberglas Corp. conducted short demonstrations on newly developed multilayered panels for polarization and diffusion of light



Architects: Marsten & Weston • *Consulting Engineers:* Ralph E. Phillips, Inc. • *Electrical Contractors:* McGee Electric Co.

The above photos were taken at Ganesha High School, Pomona, California, and illustrate the excellent lighting furnished by Smoot-Holman fixtures. Winston Nelson, principal of Ganesha High School states, "The fixtures provide ample foot candle illumination spread evenly over each room. We have noticed an absence of flicker and ballast noise, and we are pleased with the easy maintenance of these fixtures." B. J. Triggs, of Ralph E. Phillips, states, "It has long been recognized that indirect lighting is ideal for close work because of its lack of glare reflections and shadows. However, to obtain higher intensities we have used direct lighting. It was not until the advent of Smoot-Holman P-V series that we found it advantageous to use indirect lighting again. In this school we proved that in a typical classroom (28' x 45') using the 800 m. a. lamps in two rows of P-V fixtures we obtained practically the same illumination intensities as by using conventional 48". rapid start lamps in three rows of direct fixtures. Using only two-thirds of the lineal feet of fixtures and only two-thirds of the lighting outlets and light switches, we actually accomplished a considerable savings to the school board and gave them a better installation."

Send for free, informative brochure, "What You Should Know About School Lighting."

Scientifically designed lighting by **SMOOT-HOLMAN CO.**
321 N. Eucalyptus Ave., Inglewood, Calif.

People

► **Ray E. Holmes,** chief of the Rivers and Harbors section, Engineering division, Portland District, Corps of Engineers, since October 1956, has accepted an assignment to be chief of the Planning Branch of the Seattle District, Corps of Engineers. Holmes, a native of Bellingham, Wash., was recently named Multnomah County Education Citizen of the Year by the Multnomah County Unit of the Oregon Education Assn.

► **Kermit K. Miller** has been promoted to commercial manager of Snohomish County PUD. He has been serving as acting commercial manager since February 1958.

Meetings Calendar—1959

JULY

6-9—*Pacific Coast Builders* Conference, San Francisco, Sheraton-Palace Hotel.

AUGUST

11-14—*International Association of Electrical Leagues,* annual conference, Hotel El Cortez, San Diego.

18-21—*Western Electronic Show and IRE Convention,* Cow Palace, San Francisco.

24-26—*International Association of Electrical Inspectors,* Northwestern Section annual meeting, Seattle.

31-Sept. 3—*IAEI,* Southwestern Section annual meeting, Hotel Flamingo, Santa Rosa, Calif.

SEPTEMBER

7-11—*Illuminating Engineering Society,* National Technical Conference, Mark Hopkins and Fairmont Hotels, San Francisco.

16-18—*AIEE-ASME,* Engineering Management Conference, Los Angeles.

16-18—*NWPPA,* Power Use Workshop, Ephrata, Wash.

20-24—*National Association of Electrical Distributors,* Western zone convention, Hotel El Miramas, Santa Barbara.

25—*Intermountain Electrical Assn.,* Fall Dealer Conference, Newhouse Hotel, Salt Lake City.

28-30—*NELPA,* annual convention, Hotel Vancouver, Vancouver, B.C.

OCTOBER

25-29—*RMEL,* annual convention, Broadmoor Hotel, Colorado Springs.

NOVEMBER

5-6—*PCEA Hawaiian conference,* Princess Kaiulani Hotel, Honolulu.

27-Dec. 2—*San Diego Bureau of Home Appliances,* annual Electrical and Home Appliance Show, Electric Building, Balboa Park, San Diego.

► **R. C. Heerdink,** 1719 Calgary, Sunnyvale, Calif., is a new California representative of Mathias Klein & Sons.

► **C. Dudley Pratt Jr.** has been appointed director of safety of Hawaiian Electric Co. He will also continue as assistant to the manager of operations.

► **Stanley J. Brown** has been appointed sales manager of the midwestern and western areas of the Lighting Fixture division of Wasley Products Inc., of Plainville, Conn.

► **E. L. Gochnauer,** superintendent at Hungry Horse Dam for the Bureau of Reclamation, has been named power plant superintendent for the new Niagara project by the New York State Power Authority. He takes over the new job June 22.

► **Carl L. Powell** has been appointed general manager of the western division of Day-Brite Lighting Inc. Headquartering in Santa Clara, Calif., he will be responsible for sales and manufacturing in eight Western states and Hawaii. Powell has served as manager of marketing for the company.

Powell

BC Power Promotions

British Columbia Power Commission has announced the appointment of five new district managers.

J. D. Dobie, manager at Prince George, goes to the North Okanagan district and will be succeeded by W. B. Gale. R. J. Wark, district manager at Smithers, succeeds Gale at Columbia Valley.

G. E. Fairbaim becomes manager at Smithers and H. Vernon Bigwood, former assistant district manager at Vernon, becomes district manager at Quesnel to succeed Fairbaim.

► **Robert C. Devine** has been assigned to the Pacific region of Allis-Chalmers Industries Group as a service engineer. He has been a member of the company's service department at West Allis since 1953.

► **Ralph B. Johnson** has been elected president of Hawaiian Electric Co. to succeed **Leslie A. Hicks** who retired. Johnson is a native of Hawaii, a graduate of the Massachusetts Institute of Technology and has spent his entire working career in Hawaii. He joined Hawaiian Electric in 1936 and became secretary in 1939. After serving as a submarine officer in World War II, he returned to the company and worked on up to the position of executive vice-president.

Johnson

► **Dr. William A. Pearl,** administrator of Bonneville Power Administration, has been awarded the Interior Department's Distinguished Service Award. The citation states that he had "rendered invaluable service in advancing the department's water and power programs through able administration of a significant and complex federal power program in the Pacific Northwest."

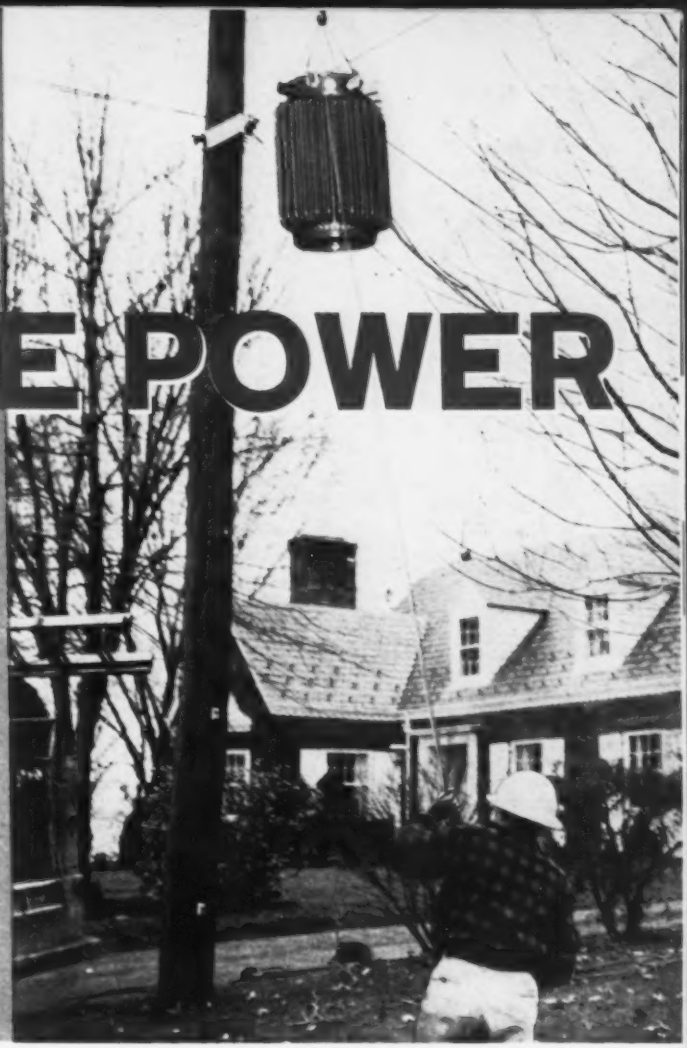
► **W. K. "Ken" Davis** has been named assistant to vice-president Howard Arnett of Portland General Electric Co. He was formerly an assistant engineer in the distribution department. Before joining PGE Davis was with Mountain States Power Co., Bonneville Power Administration, and the Corps of Engineers.

Davis

► **Dr. Hugh L. Keenleyside** has taken up duties as chairman of the British Columbia Government's Power Commission. He will resign from his role as Under-secretary of Public Administration for the United Nations to take up permanent residence in Victoria in August.

You get more POLE POWER with Pennsylvania's new 250-kva featherweight POLE STAR TRANSFORMER

Costs 15% less than station-type transformer



In 1953, Pennsylvania pioneered "higher kva" pole-mounting by introducing the 167-kva Featherweight Pole Star—an innovation that soon led to a revision of industry standards. Now, Pennsylvania extends to 250 kva the operational and economic advantages of its Featherweight pole-type design.

The ability to put 250 kva on one pole with a single transformer permits utilities to satisfy increasing demands by replacing lower rated pole-type transformers and avoiding the added expense of platforms or vaults. If, on the other hand, a utility's operating practices preclude pole-mounting of 250-kva units, the 15% *lower cost* of the new Featherweight Pole Star can apply also to platform, ground pad or vault installations.

The smaller size, lighter weight and lower cost of the new 250-kva Featherweight Pole Star are accompanied by *overall improvements in electrical characteristics*. Compared to a 250-kva station-type unit, the new Pole Star has lower losses, greater efficiency at all load percentages, better regulation, lower exciting current, and lower impedance. It features the same ease-of-handling as its 167-kva forerunner.

Before your next 250-kva purchase—whether for pole-top or some other type of installation—it will pay you to consider the lower cost and other advantages of Pennsylvania's new 250-kva Featherweight Pole Star, available through 15 kv. Contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

A STATISTICAL COMPARISON

250-Kva Featherweight Pole Star vs. Station-type
(*Example:* Transformer rated 7200/12470Y—120/240 volts; with taps)

	Featherweight	Substation-type	% Smaller or Lighter
Overall Height	59 in.	81 in.	27.1%
Width	36½ in.	37 in.	2.0%
Depth	31½ in.	46 in.	31.5%
Net Weight	1750 lbs.	3400 lbs.	48.5%

ALL ELECTRICAL CHARACTERISTICS HAVE BEEN IMPROVED
COST REDUCED APPROXIMATELY 15%

PENNSYLVANIA DISTRIBUTION TRANSFORMERS

McGRAW EDISON

POLE STAR

► **Edward P. Skralskis** has been appointed general manager of operations for Omark Industries Inc., Portland, Ore. Skralskis has been with Omark since 1954, serving as assistant general manager for the past three years. In the new capacity he will coordinate Omark's financial, manufacturing and selling activities.

Skralskis

► **W. K. Gwyer** has been appointed assistant general manager of West Kootenay Power & Light Co. He was formerly with Consolidated Mining & Smelting Co.

► **Ray Morgan,** former sales manager of General Electric Supply in Los Angeles, has joined Randolph Engineering in San Gabriel.

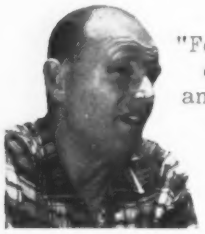
► **Walter Mandick** has received appointment as director of public relations and advertising for Canadian Utilities Ltd. Prior to joining the company he published a weekly newspaper.

Rowan

Gillett

► **J. H. Rowan,** following his retirement as director of purchases for Kaiser Engineers, has assumed a consulting position as director of special purchases for the firm. He retired after more than 20 years with the organization. In his new consulting capacity, Rowan will be responsible for specialized procurement from world suppliers. Succeeding Rowan ae director of purchases is **Lee J. Gillett,** formerly procurement manager. He has been with Kaiser Engineers since 1952 and has been at the Oakland headquarters since 1955.

► **T. M. Leps,** chief civil engineer for Southern California Edison Co. for the past eight years, has been appointed manager of organization and procedures. **R. W. Dennis** has been named chief civil engineer and **B. R. Laverty** has been designated assistant chief civil engineer.



"For a combination electrical field office and storage shed that's quick to move on and off the job, I like Porta House. We have them on several jobs."

Just phone Porta House collect and get immediate delivery. Prefabricated, bolted, waterproof plywood panels . . . can be moved on a pick-up truck.

SIZES 6' OR MORE BY 9' OR MORE.

PORTA HOUSE

Ridgely K. Dodge / 6767 Broadway Terrace, Oakland, Calif.

Phone collect for immediate delivery: OLympic 2-7237

NEEDED NOW!

ELECTRONIC ENGINEERS in ALASKA

$5430 to $8810 per annum plus 25% cost-of-living allowance. Enjoy a career in the Federal Civil Service with paid annual and sick leave, retirement benefits, paid transportation to Alaska and return for leave purposes. Positions in Federal career service. Contact:

Federal Aviation Agency
P. O. Box 440, Anchorage, Alaska

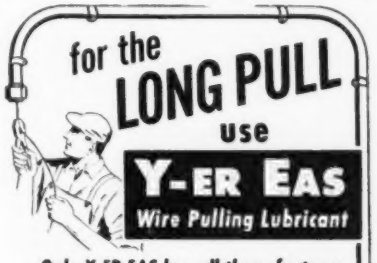
DIRECTOR OF SALES

Western Division—One of the New Majors

Outstanding opportunity for 30-40 year old sales executive with demonstrated background of achieving goals through people. Will administer 15 man sales force reporting through two regional sales managers; manager of sales administration; pricing and quotations manager with a 5 man staff and will be a member of policy formulating staff group. West Coast Division is presently primarily engaged in fluorescent equipment manufacture and is one of 4 majors with approximately 15% of the market. Write for a job description. Send details of your background. Write Box 303, Electrical West, San Francisco 4, Calif.

FIELD SALES MANAGER

Established, aggressive, growing Southern manufacturer of products for the electrical industry (OEM's and utilities) seeks man qualified to supervise and work with nation-wide sales organization. Applicant must be good organizer, have executive abilities, and be able to train and inspire field sales force. Electrical Engineering or Mechanical Engineering degree desirable. Excellent salary, bonus and fringe benefits. Ideal working conditions. Give full details on first reply. Write Box 304, Electrical West, 68 Post St., San Francisco 4, Calif.



Only Y-ER EAS has all these features

Write for descriptive booklet

- Creamy, non-corrosive lubricant. Never greasy or messy.
- Prevents sticking or setting. Specially helpful on saddles and turns.
- Does not run back on cables.
- Never harmful to hands or clothing.
- Permanently non-harmful to cables or conduit.

GIVES THE SLIP TO—
Lead, Rubber, Braid or Synthetic Covered Cables

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ELECTRO COMPOUND CO.
4148 W. 150th St., Cleveland 35, Ohio

Installation: Jewish Community Center, Detroit, Michigan
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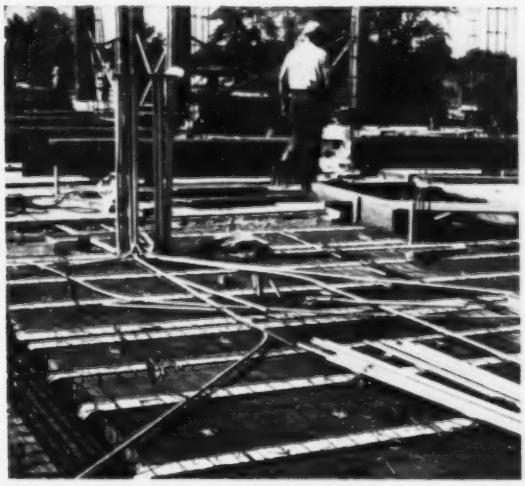
A. Woronoff, Supervising Architect
Contractor: Lerner-Linden Construction Company
Electrical Contractor: Donn Resnick Electric Company

IN COMMUNITY SERVICE CENTER, DETROIT

THE BEST COSTS LESS INSTALLED



Uniform concentricity of Republic ELECTRUNITE E.M.T. assures snug fit of couplings and connectors—shutting out moisture and concrete. Proof can be found in the millions of feet of ELECTRUNITE that has been installed in concrete. Installations made more than 25 years ago are still in service.

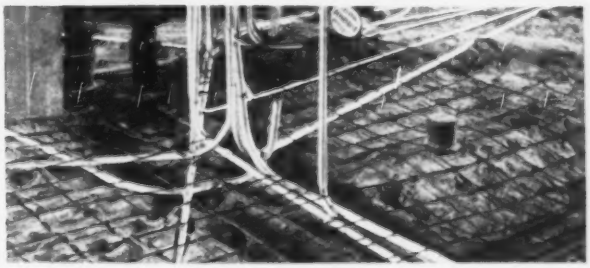
In schools, institutions, monumental buildings such as the Jewish Community Center, Detroit, Michigan . . . electrical contractors prefer Republic ELECTRUNITE® E.M.T. because . . . the *best* costs *less* installed!

ELECTRUNITE E.M.T. is lightweight, easy to handle. Bending is easier. Wire-pulling, wire-pushing is easier. Yet, ELECTRUNITE provides all the corrosion-resistance, strength, and protection of steel.

ELECTRUNITE is "INCH-MARKED"® in feet and inches for easy, accurate measuring. Full length "GUIDE-LINES"® keep bends in the correct plane. Exclusive "INSIDE-KNURLING" with new SILVERSLICK inside finish makes wire-pulling up to 37% easier.

ELECTRUNITE is produced to American Standards C80.3—Federal WWT-806 Specifications, and carries the Underwriters' Laboratories Seal of Inspection. Get Republic ELECTRUNITE E.M.T. facts first-hand—call your local electrical distributor. Or, write direct. Send coupon.

Easy bending Republic ELECTRUNITE E.M.T. takes the worry out of making back-to-back and saddle bends. Follow the full-length "GUIDE-LINE" and markings on the Republic Bending Tool to avoid "wows", wasted time and wasted materials.



Ready for concrete—runs in place, stub alignments set up, re-inforcing wire down. Republic ELECTRUNITE E.M.T. resists concrete corrosion. Additives will not attack it. No evidence of galvanic action after years of service.

REPUBLIC STEEL
STEEL AND TUBES DIVISION

REPUBLIC STEEL

Cleveland 8, Ohio

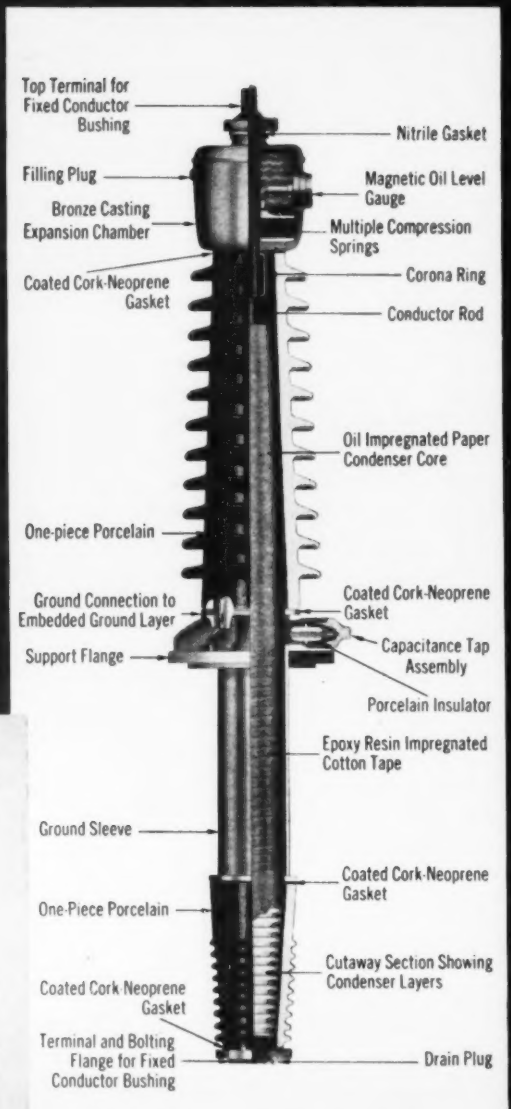
REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
DEPT. C-8099-A
216 EAST 131st STREET • CLEVELAND 8, OHIO

I would like to learn more about the installation advantages and economics of Republic ELECTRUNITE E. M.T. Please send information.

Name_____ Title_____
Firm_____
Address_____
City_____ Zone____ State_____

For phone number of closest representative see advertising index in back of book.

Why Federal Pacific developed its own superior bushings for oil circuit breakers and transformers



Glen A. Dusch, Marketing Manager—Pacific Switchgear Division, demonstrates the complete line of Federal Pacific bushings: 69 kv, 115 kv, 138 kv, 161 kv, 196/230 kv.

Bushings are the critical point where high voltage lines enter powerful breakers and transformers. Electrical and mechanical performance of available bushings did not measure up to Federal Pacific quality standards. So we undertook the development of our own, meeting new ASA and NEMA standards, superior in performance and more compact than the other designs. It was made possible by Federal Pacific developed electronically controlled equipment that provides a new and more effective wrapping of insulating foil and paper, new impregnation methods, and test devices that permit visual checking of impregnation and gas voids. As a result of this progress Federal Pacific builds a line of high voltage entrance bushings with hard-fact superiority to older, larger designs. Write for Bulletin 4-610, Federal Pacific Electric Company, General Offices: Newark 1, N. J.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

For phone number of closest representative see advertising index in back of book.

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Denver AComa 2-2347
Salt Lake City EMpire 4-3582

Eagle Electric Mfg. Co., Inc. 26
San Francisco: Brill Electric Sales SUtter 1-7547
Los Angeles: D. Niemann MAdison 6-7736
Portland: M. Levin CApitol 2-9591

Electro Compound Co. 100
Los Angeles: Matzinger-Johnson Co. MAdison 4-8001
Portland: Oregon Mfg. Agents Capitol 6-3971
Denver: R&M Sales Spruce 7-2515
San Francisco: Geo. R. Magnes Co., Inc. EXbrook 7-5663

Fanner Mfg. Co. 91
San Francisco: Sold Through Line Material Industries PLaza 5-8600
Los Angeles RAymond 3-6251 and OXford 5-2260
Phoenix ALpine 4-8471
Denver: Slaybaugh & Thompson AComa 2-5826
Portland: A. L. Polich CApitol 3-6241

Federal Pacific Electric Co. 102
San Francisco ATwater 2-0810
Los Angeles CLinton 7-8281
Seattle ATwater 3-7801
Oswego, Ore. NEptune 6-4573
Salt Lake City: James Stephens Co. ELgin 5-3540
Denver: R. D. Florence Co. AComa 2-1573
Hamilton Associates CHerry 4-1505
Albuquerque: F. W. Gorman CHapel 7-1596
Phoenix: Elec'l. Eng. & Sales Corp. ALpine 3-0927

Fisher-Pierce Co. Inc. 31
San Francisco: Maydwell & Hartzell ATwater 8-6900
Los Angeles: Maydwell & Hartzell MAdison 8-7245
San Diego: Maydwell & Hartzell JU 2-6749
Phoenix: Maydwell & Hartzell ALpine 2-5858
Seattle: Oscar Hogenson MAin 2-0737
Portland: J. A. Tudor Asso. BEImont 2-1188
Denver: Allen I. Williams MAine 3-0343

Fluor Corp. Ltd. 88, 89
Los Angeles ANgelus 2-6111
San Francisco SUtter 1-5805

G & W Electric Specialty Co. 38, 39
San Francisco: C. E. Ingalls Sons GArfield 1-2916
Los Angeles: R. E. Cunningham & Son MAdison 8-1105
Seattle: W. R. Hendrey Co. MAdison 3-3968
Salt Lake City: Riter Engineering Co. EMpire 3-7933
Denver: H. C. Guire Co. SPruce 7-2864
Albuquerque: Frank W. Gorman CHapel 7-1596

General Electric Co.
Schenectady, Apparatus Div. 33, 34, 35, 36, 69, 70, 71, 74, 75
San Francisco DOuglas 2-3740
Los Angeles MAdison 5-7381
Phoenix ALpine 8-7724
Denver KEystone 4-7171
Boise 4-3021
Salt Lake City EMpire 4-1891
Portland ATwater 8-0281
Seattle MAin 4-8300

Greenlee Tool Co. 40
San Francisco: Lippincott Co. Inc. EXbrook 2-2687
Los Angeles: Lippincott Co. Inc. MAdison 8-8186
Seattle MAin 3-3085
Salt Lake City CRestwood 7-1298

Hill Trnasformer Co. 4th Cover
San Carlos LYtel 3-2161
Los Angeles: Maddox Sales Co. MAdison 4-2306
Seattle: Wm. O. Proby & Assoc. MAin 3-3483
Portland: Wm. O. Proby & Assoc. CApitol 8-7261
San Francisco: Campbell & George MIssion 8-1236
Denver: H. C. Guire SPruce 7-2864
Salt Lake City: Stevens Sales INgersoll 7-5489
Phoenix: Maddox Sales Co. ALpine 2-2371
Albuquerque: Ralph D. Black Co. ALpine 5-9265

Hubbard and Co. 94
Emeryville, Calif. OLympic 2-6600
Los Angeles MAdison 4-8631
Oswego, Portland NEptune 6-2390
Salt Lake City ELgin 5-9478

Indiana Steel & Wire Co. Inc. 8
Graybar in following cities:
San Francisco MArket 1-5131
Los Angeles ANgelus 3-7282
Portland CApitol 7-6641
Seattle MUtual 2-0123
Denver TAbor 5-7111
Salt Lake City ELgin 9-8771

Jet Line Gun Co. 83

Kaiser Aluminum & Chemical Corp. 24, 25
Oakland CRestview 1-2211
Los Angeles MAdison 6-4801
Denver ALpine 5-3459
Phoenix ALpine 3-4841
Portland CApitol 6-4351
Seattle MAin 3-7821
Spokane TEmple 8-2704

Kearney Corp., James R. 23
Maydwell & Hartzell, Inc., in following cities:
San Francisco ATwater 8-6900
Los Angeles MAdison 8-7245
Seattle MAin 4-2368
Portland CApitol 8-4173
Spokane MAdison 4-3285
Phoenix ALpine 2-5858
San Diego JU 2-6749
Salt Lake City: Conely Engineering Co. EMpire 3-5013
Golden, Colo.: Ralph Smith CRestview 9-5279

Lapp Insulator Co. Inc. 4, 5
San Francisco: Donald E. Ingalls JUneau 6-0332
Los Angeles: Earl S. Condon & Co. DUnkirk 1-3951
Seattle: Charles F. James MAdison 3-1531
Salt Lake City: Riter Engineering Co. EMpire 3-7933
Butte: R. E. McDonough Co. 2-5447

Lighting Dynamics Third Cover
San Diego KImberly 5-4993
Los Angeles RAymond 3-9101
San Francisco JUniper 6-5266
Portland: Clyde Dodd CApitol 7-6557
Seattle: Don Gleason LAkeview 5-5151
Phoenix: Ray Wendling ALpine 2-2541

McCabe Powers Auto Body Co. 3
Berkeley LAndscape 4-4416
Portland BEImont 6-1178
Pomona NAtional 4-6464
Phoenix BRidge 5-5774
Salt Lake City DAvis 2-5658
Spokane FAirfax 5-2591
Los Angeles RIchmond 9-3424

McCormick & Baxter Creosoting Co. 22
San Francisco YUkon 2-4033
Los Angeles CHapman 5-4667
Portland AVenue 6-3654

Mark & Co., Clayton 14
San Francisco: Hodges & Glomb, Inc. UNderhill 1-2367
Los Angeles: Rutkin Elec'l. Sales Co. MAdison 3-1224
Denver: W. E. Young Co. AComa 2-4841
Seattle: Electric Agencies MAin 3-2360

Moloney Electric Co. 78
Garland Affolter in following cities:
San Francisco EXbrook 7-1800
Los Angeles MAdison 4-1864
Portland CApitol 3-7349
Seattle MUtual 2-4950
Denver: Hamilton Associates CHerry 4-1505
Salt Lake: Riter Engineering EMpire 3-7933

Morrison-Pelsue 104
Denver RAce 2-2834
North Hollywood: A. F. Johnson STate 7-8544
Salt Lake City: W. H. Pingree Co. EMpire 3-6731

National Supply Co., Tubular Prod. Div. 6
San Francisco DOuglas 2-2975
Los Angeles: Murphy-Hain Co. MAdison 2-2138
Seattle: J. H. Stumph MUtual 2-5232
Denver: Allen B. Carpenter KEystone 4-0283
Farmington, Utah: David Merrill AXtel 5-4631

Okonite Co. 41
Los Angeles MAdison 4-9677
San Francisco VAlencia 4-7474
Portland CApitol 8-3173
Seattle MAin 4-5277
Denver: Sales Engineers AComa 2-4893
Salt Lake City: Sales Engineers HUnter 5-3457

Orangeburg Mfg. Co. Inc. 30
San Francisco YUkon 6-0462
Santa Ana LInco'n 4-1195
Seattle MUtual 2-4566
Newark, Calif. SYcamore 3-2200

OZ Electrical Mfg. Co. 27
San Francisco: Eichorn & Melchior DOuglas 2-1038
Los Angeles: Agencies Co. MAdison 6-5443
Denver: Harry F. Ream Sales Agency CHerry 4-0558
Portland: Wm. A. Proby Associates CApitol 8-7261
Seattle: Wm. A. Proby Associates MAin 3-3483

Pacific Gas and Electric Co. 44
San Francisco SUtter 1-4211

Pennsylvania Transformer Div. 99
San Francisco: George E. Honn Co. SUtter 1-7352
Los Angeles: John G. Corrin MAdison 2-0830
Seattle: Fred W. Carlson ATwater 4-4630
Phoenix: Roy E. Coulson WIndsor 3-8935
Denver: Peterson Co. DExter 3-5434
Salt Lake City: Clarence W. Silver ELgin 5-5378

Porta House 100
Oakland OLympic 2-7237
Sacramento: Robert Crownin GIlbert 3-8543
Portland: Bardi Gen. Contractors PRospect 5-4354
Los Angeles: Construction Supply Co. LUdlow 3-4158
Los Angeles: Ball & Black ANgelus 9-7586
San Bernardino: Kingsley, H. P. TUrner 9-8551
Santa Ana: Blystone Equip. Co. KImberly 2-3918

Preformed Line Products Co. 64
San Francisco: K. M. Ryals Co. YUkon 2-5510
Los Angeles: Earl S. Condon Co. DUnkirk 1-3951
Seattle: Shaffer & Nelson Inc. MUtual 2-0186
Portland: Shaffer & Nelson Inc. BEImont 4-7437
Salt Lake City: Shaffer & Nelson Inc. ELgin 5-8304
Spokane: Shaffer & Nelson Inc. FAirfax 7-9528
Denver: Peterson Co. DExter 3-5434

R T & E Corp. 2nd Cover
Portland MErcury 9-2161
Medford: H. L. Mooney SPring 2-9948
San Jose: N. R. Beebe ANdrews 4-5641

(Continued on page 104)

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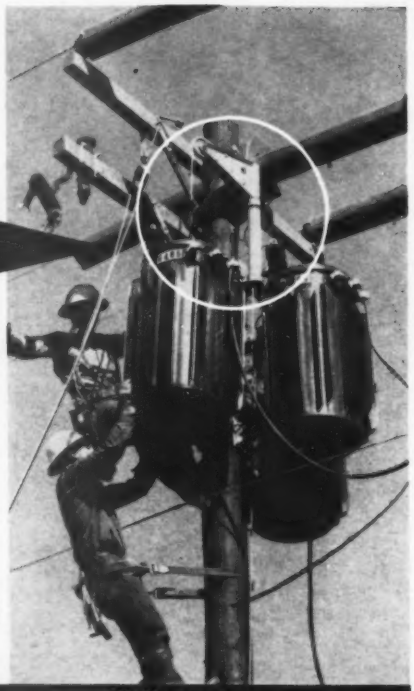

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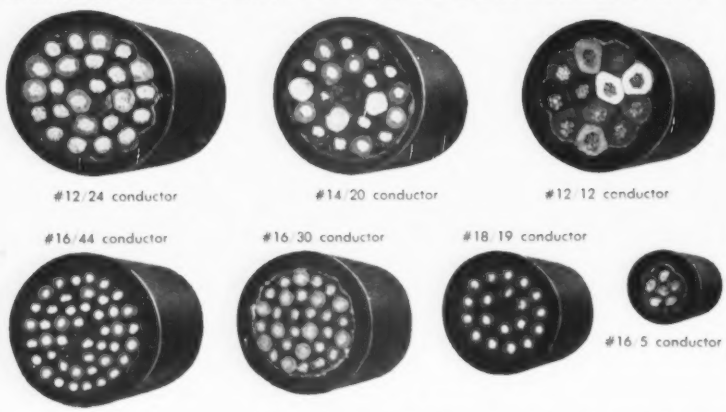

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(Continued from page 103)

Pasadena: D. B. Cole SYlvan 0-5977
Salt Lake City: T. R. Van Wagoner Co. INgersol 6-2461
Bellevue, Wn.: K. H. DuBois SHerwood 6-4114
Butte: R. A. Manning Butte 2-9200

Republic Steel Corp. 101
San Francisco GArfield 1-0977
Los Angeles MAdison 4-5144
Portland: Shaffer & Nelson Inc. BElmont 4-7437
Seattle: Shaffer & Nelson Inc. MUtual 2-0186
Spokane: Shaffer & Nelson Inc. FAirfax 7-9528
Denver: C. D. Belt Co. SKyline 6-9421

Royal Electric Co. Inc. 10
Los Angeles: Eckert-Lloyd Co. Richmond 7-9655
San Francisco: Eckert-Lloyd Co. HEmlock 1-5792
Seattle: Northwestern Agencies MAin 3-8882
Portland: Northwestern Agencies CApitol 7-0434
Phoenix: Wm. Benndorf CRestwood 7-1662
Denver: Hyde Electronics Co. WEst 6-3456

S & C Electric Co. 28, 29
Burlingame, Calif. OXford 7-1130
San Gabriel, Calif.: Randolph Eng. Corp. CUmberland 3-4183
Phoenix: Randolph Eng. Corp. ALpine 8-5281
Salt Lake City: Riter Engineering EMpire 3-7933
Seattle: Muth-Richards Co. EAst 3-2128
Portland: Andrew L. Polich, Inc. CApitol 3-6241

Sangamo Electric Co. 80, 81
San Francisco: L. A. Nott HEmlock 1-4738
Los Angeles: (Factory Sales) DUnkirk 7-2336
(Time Switches) ANgelus 8-6771
Seattle: T. R. Wood MAin 3-8204
Denver: Mt. States Macchinery CHerry 4-7421
Phoenix: J. E. Redmond Co. ALpine 4-8471
Portland: R. E. Kenyon CApitol 3-8742
Butte: R. E. McDonough BUtte 2-5447

Slater Mfg. Co. 87
San Francisco: Baxter Co. MArket 1-8636
Los Angeles: Jack Payne Co. MAdison 4-7317
Denver: Don Steinkamp EAst 2-7961
Bruce Emmett in following cities:
Portland BElmont 2-8117
Seattle MUtual 2-6737
Spokane FAirfax 7-5670
Salt Lake City DAvis 2-3828

Smoot-Holman Co. 97
San Francisco MArket 1-8474
Los Angeles ORegon 8-8981
Salt Lake City: J. R. Christensen EMpire 3-4419
Seattle: F. C. Scharr ATwater 2-9230
Portland: Clay Barton CApitol 8-3520

Southern California Edison Co. 66
Los Angeles MAdison 4-7111

Southern States Equipment Corp. 18
Seattle: Jos. C. Platt MAin 3-6141
Salt Lake City: H. Lee Rawlings Co. ELgin 9-8811
Denver: R. T. Lewis Co. EAst 2-1082
Los Angeles: W. E. Kirk Co. MAdison 4-3651
Portland: C. F. Selby NEptune 6-6442
Oakland: John H. Ormond TWinoaks 3-3235

Square D Co. 85
Los Angeles CApitol 1-1171
San Francisco JUniper 7-4590
Seattle EAst 3-1474
Portland BElmont 4-8488
Denver KEystone 4-6234
Salt Lake City DAvis 2-5859
Phoenix ALpine 8-6448
El Paso KEystone 3-0544
Spokane FAirfax 8-3690
San Diego BElmont 3-7621
Fresno AMherst 8-6268

Triangle Conduit & Cable Co. 32
San Francisco UNderhill 3-6260
Los Angeles RAymond 3-3687
Seattle MUtual 2-3971
Denver SPruce 7-2375

Utility Body Co. 9
Oakland TWinoaks 3-8980
Los Angeles: Jumbo Equip Co. RIchmond 9-6272
Portland: Douglas Hood Co. CApitol 2-9178
Seattle: Truck Welding & Equip. Co. ATwater 4-1172
Spokane: Evergreen Truck Equip. Co. KEystone 5-3677
Salt Lake City: The Lang Co. DAvis 8-8341
Boise: The Lang Co. Boise 3-4933
Phoenix: Trailmobile, Inc. APplegate 8-8568
Albuquerque: Rio Grande Sales CH 2-5403
El Paso: Hobbs Trailer Sales Co. KEystone 2-2489
Denver: Jacobs-Kerr & Co. TAbor 5-5328

Wesix Electric Heater Co. 65
San Francisco GArfield 1-2211
Los Angeles HUbard 3-7540
Sacramento GIlbert 8-4120
Seattle SEneca 0391
Portland GArden 2-8469
Spokane MAdison 4-6175

Western Insulated Wire Co. 86
San Francisco: Curry Co. YUkon 2-0788
Seattle: J. H. Stumph Co. MUtual 2-5232
Albuquerque: John Carder CHapel 2-3581

Wagner Electric Corp. 42, 43
South San Francisco PLaza 6-0520
El Segundo, Calif. ORegon 8-7671
Portland CApitol 7-3654
Salt Lake City EMpire 3-5013
Denver MAin 3-0209

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